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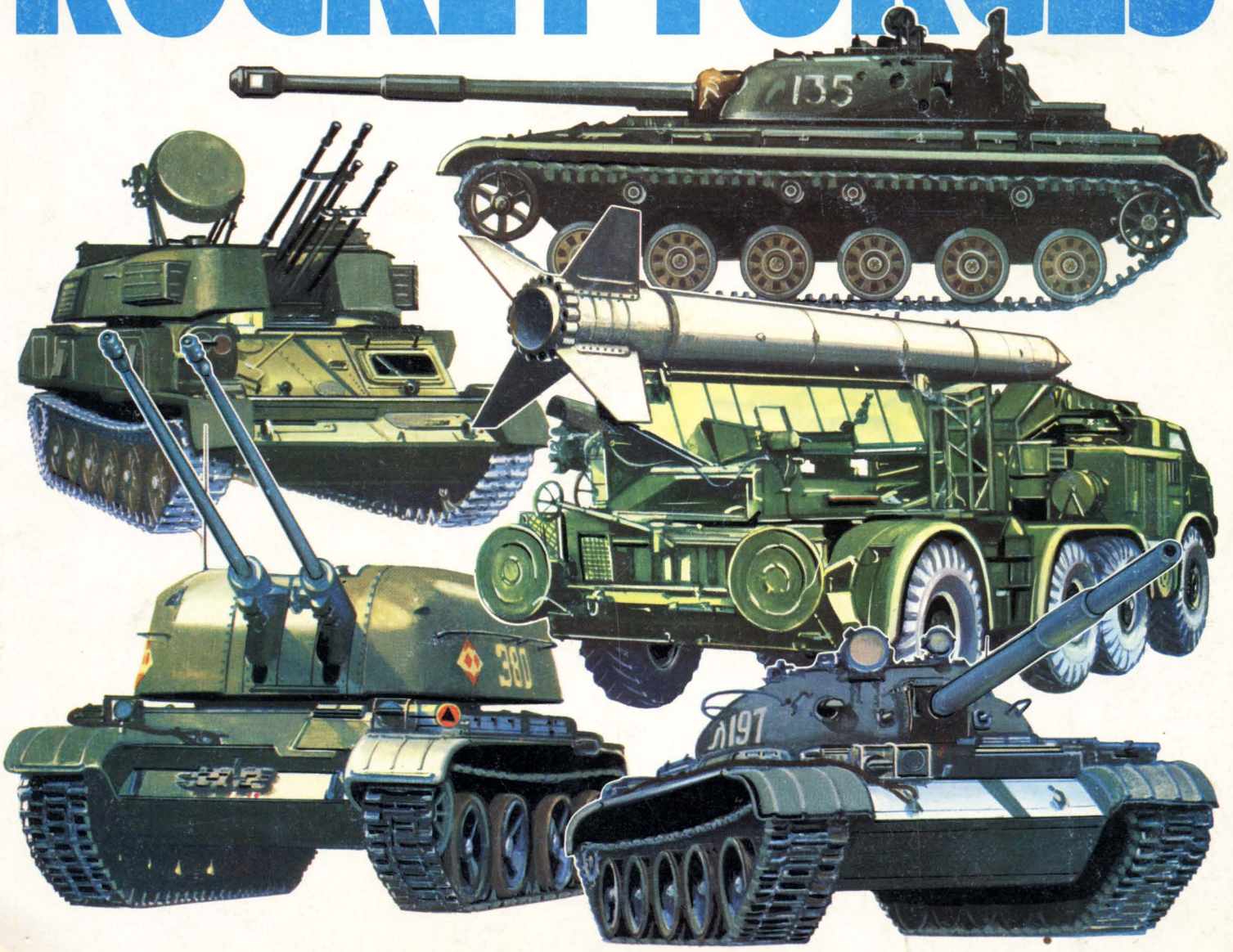
SOVIET GROUND AND ROCKET FORCES



SOVIET GROUND AND ROCKET FORCES

by
Christopher Donnelly, Bill Gunston and Dr. James E. Dornan

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The Soviet Ground Forces

Christopher Donnelly

The Soviet Ground Forces constitute a separate arm of service in the Soviet Union, second in importance only to the Strategic Rocket Forces. The 1,825,000 men under the command of General of the Army I. G. Pavlovskii form the very foundation of the Soviet Army; and although in the Khrushchev period their importance was in fact diminished as a result of that politician's belief that any major war would inevitably be waged with strategic nuclear weapons, today the Ground Forces' importance is fully recognised by the leaders of the USSR. As a result the Ground Forces are being constantly strengthened and modernised, to improve their capability to fight either a conventional or a nuclear war.

The various types of troops that go to make up the Ground Forces fall into four broad categories: the teeth arms – motor-rifle (motorised infantry), tank and airborne troops; the artillery – missile troops, air-defence and field artillery; the special troops – engineer, signals and chemical troops; and supporting arms and rear services – transport, medical, traffic control and police etc.

A division is the basic all-arms formation, and the Soviets class their divisions as either Motor-Rifle, Tank or Airborne according to the identity of the major fighting arm in the division. The basic unit of the Soviet Ground Forces is the regiment, which is made up of three or four battalions plus support elements.

Motor-Rifle Battalion organisation

The probable composition of the motor-rifle battalion, the basic motorised infantry sub-unit, is given in a table. The battalion's teeth are its three motor-rifle companies, each of three platoons, each of three sections. A section travels in an armoured personnel carrier (APC) which may be of the BTR-50, BTR-60 or BMP series. The tracked BTR-50, used to carry infantry in tank divisions, and the wheeled BTR-60, used to carry infantry in motor-rifle divisions, are both in the process of being replaced by the modern BMP combat vehicle, which has better mobility and firepower. The battalion's artillery support is provided by six 120-mm mortars and, in battalions not

T-55 Tanks photographed during a large-scale Soviet Army exercise

equipped with the BMP (which carries an anti-tank missile on each vehicle), an anti-tank platoon of two recoilless anti-tank guns and two anti-tank guided weapons (ATGWs). Battalion logistic support is contained in a tail of only seven or eight vehicles, for, as will be explained below, logistics are cut to a minimum to increase flexibility. A battalion will be supplied from the vehicles held by its parent regiment.

A tank battalion, the basic armoured sub-unit, is organised on similar lines, but has no mortars or anti-tank support, and has a slightly larger tail. The tank platoons in the tank battalions of a tank regiment have ten tanks per company, i.e. 31 per battalion. The tank platoons in the tank battalion organic to motor-rifle regiments have four tanks per platoon, i.e. 40 per battalion.

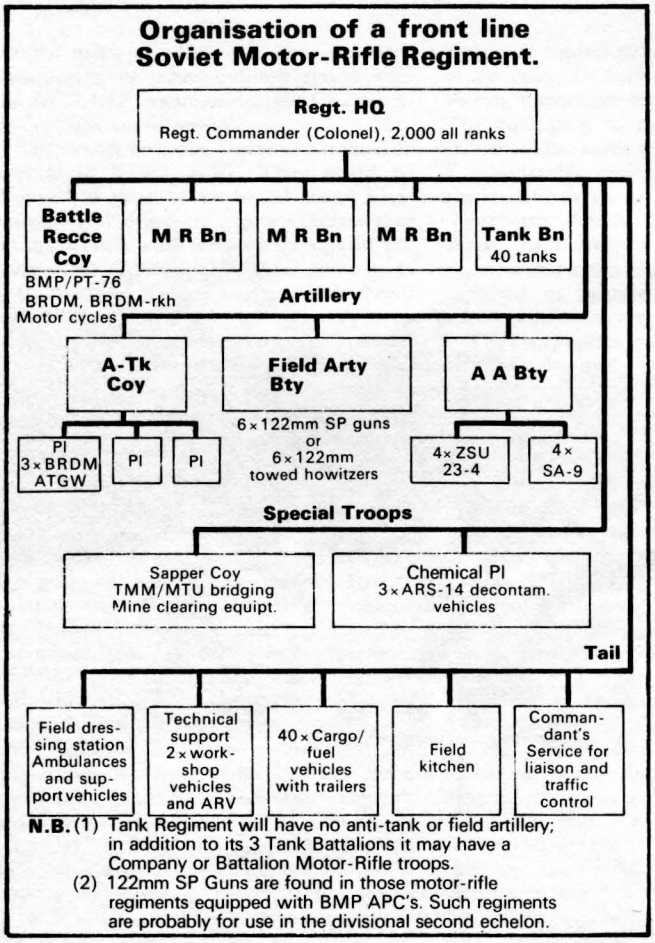
The basis of a motor-rifle regiment is three motor-rifle battalions plus one tank battalion of 40 tanks. In addition a regiment has strong support elements: a strong reconnaissance company equipped with PT-76 light amphibious tanks (now being replaced by BMPs), BRDM heavy armoured reconnaissance vehicles and motorcycles for reconnaissance and liaison. At least two of the BRDMs will be equipped for reconnaissance in a nuclear, biological and chemical warfare (NBC) environment. Artillery support is provided by an anti-tank company, equipped with 'Sagger' or 'Swatter' ATGWs mounted on BRDM vehicles; an anti-aircraft battery of four ZSU-23-4 multi-barrelled AA tanks, and four SA-9 infra-red homing missiles mounted in packs of four on BRDM (twin 23-mm cannon, trolley-mounted, are available in some regiments in addition to or instead of the new SA-9); and a field battery of six 122-mm D-30 towed gun-howitzers. These will probably be replaced eventually by 122-mm self-propelled (SP) guns (some regiments may be allotted as many as 18 towed 122-mm guns for field artillery support as the new SP guns are introduced.

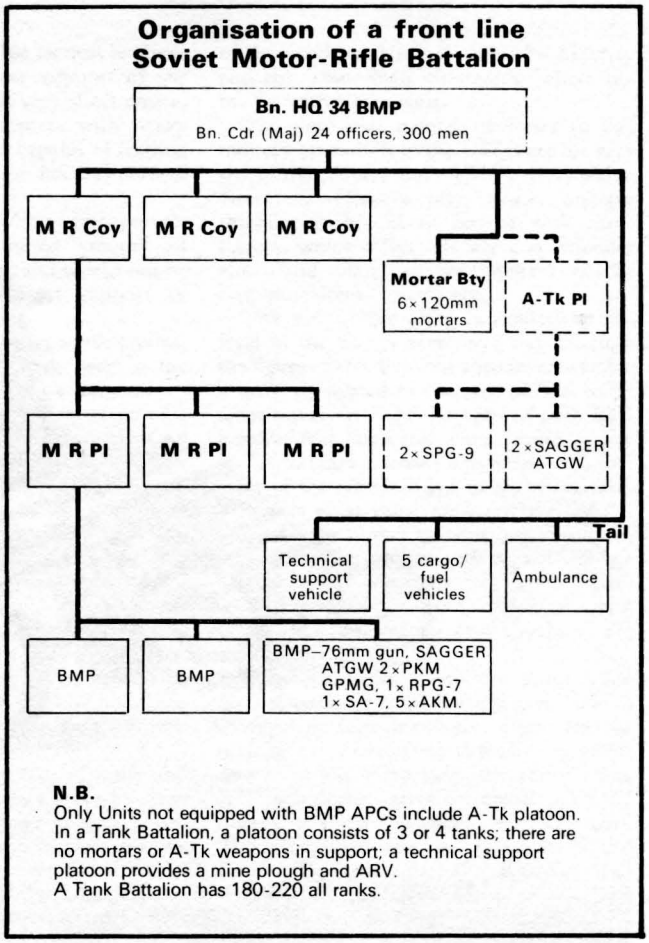
A tank regiment is a considerably smaller organisation, with only 1,300 officers and men at the most. Its basis is three tank battalions, 95 tanks in all. In the past, tank regiments had no organic motor-rifle troops, but it is now thought that, in the front-line units, at least a company, and in some cases a battalion, of motor-rifle troops is included in the regiment. Artillery support is also absent — the tank regiment has only anti-aircraft artillery for protection, utilising the ZSU-23-4 and the older ZSU-57-2 twin-barrelled anti-aircraft tank, although this is gradually being replaced by SA-9.

Both tank and motor-rifle regiments have engineer mine-clearing and river-crossing support, and decontamination equipment. The light regimental tail provides scanty field recovery and repair facilities and a small medical post as well as cargo and fuel vehicles to resupply the sub-units.

The organisation of the basic all-arms formation, the division, is founded upon three motor-rifle regiments and one tank regiment for motor-rifle divisions, and three tank and one motor-rifle regiment for tank divisions. Recent increases in the numbers of tanks in motor-rifle regiments and divisions have, however, tended to make the motor-rifle division an equally balanced tank and infantry formation, while the tank division remains an armour-heavy formation. Both divisions have strong reconnaissance battalions with a commando-type parachute company for deep penetration; they also have effective battlefield radar and direction-finding equipment, as well as armoured vehicles for ground reconnaissance in conventional and nuclear war. A motor-rifle division alone has an extra tank reserve of some 40–50 tanks.

Both motor-rifle and tank divisions have a considerable amount of artillery in addition to that held by their regiments. Air cover is provided by 24 57-mm towed AA guns and a battalion of SA-6 AA missiles. A motor-rifle division alone has 18 100-mm towed anti-tank guns. Field artillery support is provided by three battalions, each of 18 122-mm guns; in motor-rifle divisions only,


Organisation of a front line Soviet Motor-Rifle Regiment.
Regt. HQ
Regt. Commander (Colonel), 2,000 all ranks
Battle Recce Coy
M R Bn
M R Bn
M R Bn
Tank Bn
40 tanks
BMP/PT-76
BRDM, BRDM-rkh
Motor cycles
Artillery
A-Tk Coy
Field Arty Bty
A A Bty
PI
3×BRDM ATGW
PI
PI
6×122mm SP guns
or
6×122mm towed howitzers
4×ZSU 23-4
4× SA-9
Special Troops
Sapper Coy
TMM/MTU bridging
Mine clearing equipt.
Chemical PI
3×ARS-14 decontam. vehicles
Tail
Field dressing station Ambulances and support vehicles
Technical support 2×workshop vehicles and ARV
40×Cargo/ fuel vehicles with trailers
Field kitchen
Commandant's Service for liaison and traffic control
N.B. (1) Tank Regiment will have no anti-tank or field artillery; in addition to its 3 Tank Battalions it may have a Company or Battalion Motor-Rifle troops.
(2) 122mm SP Guns are found in those motor-rifle regiments equipped with BMP APC's. Such regiments are probably for use in the divisional second echelon.


Organisation of a front line Soviet Motor-Rifle Battalion
Bn. HQ 34 BMP
Bn. Cdr (Maj) 24 officers, 300 men
M R Coy
M R Coy
M R Coy
Mortar Bty
6×120mm mortars
A-Tk Pl
M R Pl
M R Pl
M R Pl
2×SPG-9
2×SAGGER ATGW
Tail
Technical support vehicle
5 cargo/ fuel vehicles
Ambulance
BMP
BMP
BMP–76mm gun, SAGGER ATGW 2×PKM GPMG, 1×RPG-7 1×SA-7, 5×AKM.
N.B.
Only Units not equipped with BMP APCs include A-Tk platoon. In a Tank Battalion, a platoon consists of 3 or 4 tanks; there are no mortars or A-Tk weapons in support; a technical support platoon provides a mine plough and ARV.
A Tank Battalion has 180-220 all ranks.

one battalion is equipped with 152-mm guns, which are beginning to be replaced by a new 152-mm SP gun.

Eighteen 40-round multi-barrelled rocket launchers and four free-flight surface-to-surface missile (SSM) launchers complete the division's formidable artillery support. The former weapon is ideal for delivering a chemical strike, and the latter a nuclear strike. A division has particularly strong mine-clearing and river-crossing support, much of the equipment it uses having been tried and proven in the Yom Kippur Israeli–Arab war of 1973. The engineers also have fair obstacle-creating ability in the way of mine-laying vehicles and trench-diggers; and chemical defence troops provide good decontamination ability with personnel and vehicle decontaminating equipment.

Above left: **The Soviets use mortar fire for suppression of enemy defensive positions to cover an attack. There are six 120-mm mortars in every motor rifle battalion.**

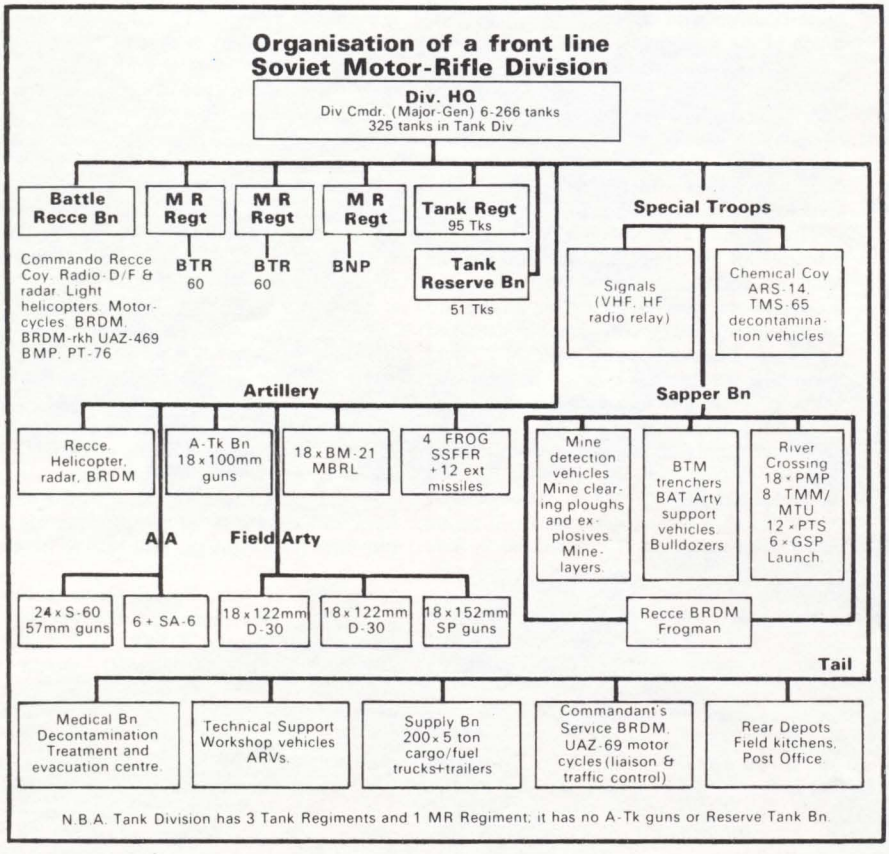
Left: **'Sagger' ATGW is launched from a BRDM1 AFV. This missile is reasonably effective up to nearly two miles and was responsible for destroying many Israeli tanks during the Yom Kippur war.**

The division's logistic tail is true to the principle of lightness and flexibility. The recovery and repair facilities of the technical support battalion are not extensive and not designed for repairing heavily damaged vehicles. The medical battalion's field hospital is designed to treat 60 bed cases at any time, but provides light treatment or immediate evacuation for many more. The divisional supply transport battalion has the task of carrying fuel and supplies forward to the regiments. Divisional movement is controlled by a strong detachment of traffic police (the so-called 'Commandant's Service') who organise routes and deployment areas and site depots etc.

The organisation of a Soviet army is flexible, with a variable number of divisions of all types. A typical combination might be three tank divisions plus two motor-rifle divisions. An army would dispose of a large amount of artillery, some of which in war would probably be retained for army use, and some of which would be allocated to whichever divisions the army commander thought to be in most need of it. As well as a large number of 122- and 152-mm gun-howitzers, army artillery includes such excellent pieces as the M1943 130-mm field gun with a range of 17 miles, the 180-mm heavy gun with an even greater range, the 160-mm heavy mortar and a variety of multi-barrelled rocket-launchers. An army commander would be extremely unlikely to allot any of his medium-range SS-1C 'Scud' nuclear missiles to a division. An army commander would also have a tank reserve which could be used to strengthen an important axis, and a large amount of engineer equipment to construct more permanent river-crossing sites.

Most of the soft-skinned transport vehicles which will be needed to supply divisions in time of war are under army control. They are not, however, held on strength in peacetime, but in event of war will be mobilised, together with their drivers, from the civilian economy. To diversify his means of fuel supply in an offensive war, the army commander might have units capable of laying tactical fuel pipelines from strategic railheads to forward depots.

In time of war, Soviet Ground Force formations, now organised into Groups of Forces (outside the USSR) and Military Districts (inside the USSR), would be organised as 'Fronts', and several Fronts together would probably be combined in a Theatre of Military Action. For example, the 20 Soviet divisions now forming the Group of Soviet Forces Germany (GSFG) would probably become a Front in war, and along with the Northern (Poland) and Central (Czechoslovakia) Group of Forces might be classed as the Central European


Organisation of a front line Soviet Motor-Rifle Division
Div. HQ
Div Cmdr. (Major-Gen) 6-266 tanks
325 tanks in Tank Div
Battle Recce Bn
M R Regt
M R Regt
M R Regt
Tank Regt
95 Tks
Special Troops
Commando Recce Coy. Radio-D/F & radar. Light helicopters. Motor-cycles. BRDM. BRDM-rkh UAZ-469 BMP. PT-76
BTR 60
BTR 60
BNP
Tank Reserve Bn
51 Tks
Signals (VHF, HF radio relay)
Chemical Coy ARS-14. TMS-65 decontamination vehicles
Artillery
Sapper Bn
Recce Helicopter, radar, BRDM
A-Tk Bn 18 x 100mm guns
18 x BM-21 MBRL
4 FROG SSFFR +12 ext missiles
Mine detection vehicles Mine clearing ploughs and explosives. Mine-layers.
BTM trenchers BAT Arty support vehicles. Bulldozers
River Crossing 18 x PMP 8 TMM/MTU 12 x PTS 6 x GSP Launch
A/A
Field Arty
24 x S-60 57mm guns
6 + SA-6
18 x 122mm D-30
18 x 122mm D-30
18 x 152mm SP guns
Recce BRDM Frogman
Tail
Medical Bn Decontamination Treatment and evacuation centre.
Technical Support Workshop vehicles ARVs.
Supply Bn 200 x 5 ton cargo/fuel trucks+trailers
Commandant's Service BRDM. UAZ-69 motor cycles (liaison & traffic control)
Rear Depots Field kitchens. Post Office.
N.B.A. Tank Division has 3 Tank Regiments and 1 MR Regiment; it has no A-Tk guns or Reserve Tank Bn.

Above: **Traditional Soviet use of artillery demands rapid deployment by battery in open positions, but as a result of the low survival rate of such positions in the 1973 Yom Kippur war, new Soviet Army artillery tactics are being discussed**

Theatre.

It is to the Front commander that the Soviet tactical air force (Frontal Aviation) would be subordinated. The Front commander would deploy his air power in co-ordination with his ground forces, allotting it to whichever sector of the battlefield he considered most important. The Front commander has in addition medium-range nuclear missiles ('Shaddock' and 'Scaleboard') which he can deploy as he wishes.

The airborne forces would also come under Front control; but, as a result of the very limited amount of air transport available to drop or air-land troops, and the great vulnerability of large-scale assault groups, the Front commander would probably detach a proportion of the airborne troops allotted to him to armies under his control.

The airborne forces are the elite of the Soviet Ground Forces. There are only seven or eight divisions, and all are stationed inside the territory of the USSR. A conscious effort is made by the Soviet authorities to maintain an elitist spirit among these troops by means of a constant propaganda campaign, a special distinctive uniform and a hard and exciting training programme. The airborne forces get the pick of the con-

scripts, many of whom will have practised parachuting or other military sports with the *DOSAAF* organisation (see Chapter 3) before their conscription.

The Soviet airborne forces are trained to operate in several roles. They could be dropped in small teams by advanced parachuting techniques to operate secretly as reconnaissance and sabotage groups in the enemy rear. Considerably larger units, up to a battalion or larger, might be deployed deep in the enemy rear on suicide missions of strategic importance, such as the destruction of a communications centre or government buildings in a city.

The airborne forces would also be used in the traditional role: they might be landed by aeroplane, parachute or helicopter in the enemy rear to fight conventionally until relieved by the advancing main forces. When used in this manner, there would be no limit to the size of the airborne force deployed; but it is unlikely that the Soviets would fly their men in in more than battalion-size groups because of their vulnerability to counter-strike, especially in nuclear war. The Soviets do insist that to mount any airborne operation of a significant size, local command of the air is essential.

An airborne battalion is organised on similar lines to a motor-rifle battalion: three companies, mortars, anti-tank support and a light tail. However, its equipment scales will vary enormously depending on its role, means of transport and means of landing. Long-range reconnaissance teams of up to a platoon in size would have only the lightest scale of issue: as they would hope to remain undetected, vehicles and heavy kit would be merely an embarrassment. However, battalion groups operating independently in the enemy rear, to exploit rapidly the effect of a nuclear strike or to seize and hold a strategic position in advance of the main forces, would be heavily equipped. The 82-mm mortars, SPG-9 recoilless anti-tank guns and portable 'Sagger' ATGWs and SA-7 AA missiles which are standard equipment in airborne battalions, could be dropped by parachute, followed by 120-mm mortars, ZU-23 twin AA cannon and 85-mm anti-tank field-guns for heavier fire support.

The battalion could also be provided with the BMD – the air-droppable infantry combat vehicle – which would give it a significant offensive capability and extra protection in an NBC environment. This vehicle replaces or supplements the old but effective ASU-57 self-propelled anti-tank gun.

A battalion group equipped with these weapons, operating in the enemy rear, would be quite a formidable force. It could be strengthened still further by helicopter-borne and air-landed equipment, if local mastery of the air could be maintained, and if, in the case of transport aeroplanes, a suitable landing field could be found.

The great increase in the number of helicopters in the Soviet Army in recent years now gives a senior Soviet commander the capability to lift several battalion groups with light scales at any one time. The great advantage of helicopters is that ordinary motor-rifle troops can be used with minimal training. This makes it more likely that helicopters would be deployed under divisional control to enable tactical landings to be made in very close support of the leading formations and at very short notice. The equipping of helicopters with heavy armament has made them capable of lending a considerable amount of fire support to any landing party.

Airborne forces, however transported, would have only a limited amount of supplies and ammunition, and would not be expected to operate without support or reinforcement for very long.

The exception is long-range strike groups, *reidoviki*, dropped in strength deep in the enemy rear to carry out a mission of strategic importance such as sabotage of a vital installation or the assassination of an important person. Having completed their task, there might be no way for such groups to return or escape. This is just their hard luck; the Soviet High Command is not likely to worry about the loss of 200 or 300 soldiers if they accomplish a mission of sufficient importance.

Formidable though the airborne forces may appear, however, their role is only subsidiary to, and in support of, the operations of the motor-rifle and tank formations; for it is on the ground that the Soviets consider the war will be lost or won.

A study of the deployment of units and formations brings one to a conclusion that the Soviet High Command envisages two major roles for the Ground Forces, in addition to the responsibility for internal security in the Soviet Union and Eastern Europe, a responsibility which they share with the para-military KGB and MOOP troops. Firstly, they must defend the USSR from invasion by land from Western Europe, the Middle East or China, and secondly, they must prosecute a war beyond the Socialist *bloc* with the aim of extending Soviet communist influence to other countries. A closer study of troop dispositions will quickly show that the force level which the Soviet High Command maintains facing China, while adequate to repel any Chinese invasion of the Asiatic USSR, is nothing like sufficient to ensure success in a major invasion of that country. The force level maintained in the European USSR and Eastern Europe, however, is certainly much higher than at present necessary to deter NATO from invading the Soviet Union, and may well be thought sufficient, under the right conditions, to invade Western Europe, defeat the forces of NATO and bring most of Western Europe under Soviet domination.

The principles of Soviet military doctrine, and therefore the shape and form of the Ground Forces, are heavily influenced by the geography and economics of the USSR. The country is so vast and the population density (even in European Russia) so low, that the state simply could not bear the cost of Maginot Line-type fortifications along its entire borders, even assuming that this kind of fortification could be made effective today. Another problem with such defensive fortifications is where to site them. Almost the whole of the European USSR is a vast plain, bounded by the Baltic Sea to the north and the Black Sea to the south, while to the west the plain stretches unbroken to Holland. Eastwards, only the rolling hills of the southern Urals lie between Moscow and the Tien Shan mountains, where the border with China runs.

The only real natural obstacles to any military operations in the USSR are the very size of the country and the large rivers which dissect it. Consequently, Soviet military thinking is bound to reckon with these factors, which affect attacker and defender alike, and plan the development of the Ground Forces accordingly.

The size of the army is limited by the level of the Soviet economy; and although the figure of 166 divisions appears enormous, it must be related to the area of land to be fought over. It is in the light of such geographic and economic considerations that Soviet military doctrine emphasises the primacy of the offensive as a means of warfare. This lays great value on the seizure of the initiative, the ability to cover large distances at great speed and the achievement of the maximum of effect by manoeuvre, concentration and surprise, together with vigorous fighting to the very depths of the enemy's position.

These principles of military doctrine the Soviets consider to be equally applicable to strategic defence or offence. Thus whether their role is strategically defensive or offensive is of less importance for the training and equipping of the Soviet Ground Forces than might have been thought. Whatever their strategic role, the Soviet Ground Forces are trained and equipped to fight any campaign by offensive means – to seize the initiative by attack or counter-attack and to carry the action to the depths of the enemy's position, so as to bring about his defeat in the shortest possible time. Only in the offensive (or counter-offensive) lies the way to victory; and in event of any major war – certainly in the event of war between capitalist and communist states – the Soviets will aim for nothing less than complete and total victory, irrespective of whether or not they start the war.

The Ground Forces are, therefore, organised, trained and equipped on one overall basic standard pattern to fight one type of war, no matter where and for what they are located; though of course those units stationed in areas where special geographic or climatic conditions appertain will be additionally trained to fight in those particular conditions.

The requirement of mobility and manoeuvrability affects organisation of units and formations, and design of equipment alike. Soviet military doctrine demands that units and formations up to divisional level are not burdened with a cumbersome, mobility-hampering logistic train. The combat vehicles themselves must carry as much as possible in the way of essential fuel and ammunition, and units have organic to them merely a flexible tail, receiving further logistic support from transport and equipment held by higher formations. The design of Soviet combat vehicles shows clearly that considerations of range, mobility and firepower are given priority over those of protection and crew comfort.

One advantage that highly mobile forces bring is the possibility of concentrating them at chosen points to achieve overwhelming local superiority over an enemy,

thus giving them the chance to break through into the depths of his position. Soviet doctrine is to exploit this by firm, centralised control at high level, with stricter subordination of formations than is common in the armies of the Western alliance. This characteristic is regarded by the Soviet High Command as one of its main strengths, permitting as it does the greatest strategic value to be obtained from a concerted effort.

It might be useful at this point to list the principles of Soviet military art – the means by which doctrine is to be put into practice – as defined by contemporary Soviet strategists and tacticians. As principles, they are equally applicable at all levels of military involvement: strategic, i.e. the overall involvement from military action at theatre

Right: **A T-62 tank company of the Transbaikal Military District. Low ground pressure and good power to weight ratio enable the T-62 to operate over very soft ground.**

Below: **The BMP is a vehicle specially designed for rapid and mass exploitation of a breakthrough of a lightly-defended point and is particularly well designed for NBC warfare**

level up to national economic and political considerations; operational, which term the Soviets use to describe military action at army or more usually at Front level; and tactical – actions at divisional level.

In order of priority these principles are given as:

(1) the achievement of mobility and the maintenance of a high tempo of combat operations;
(2) the concentration of the main effort and the creation thereby of superiority of men and *materiel* over the enemy at the decisive place and time;
(3) surprise;
(4) aggressiveness in battle – no let-up in the attack, break-through and pursuit;
(5) preservation of the combat-effectiveness of one's own troops by
  (a) being properly prepared and efficiently organised,
  (b) maintaining at all times efficient command and control over one's forces and
  (c) maintaining morale and the will to fight in one's troops;
(6) ensuring that the aim and plan of any operation conform with the realities of the situation, so that neither too much nor too little is attempted;
(7) ensuring the co-operation of all arms of service and ensuring the co-ordination of effort towards achieving the main objectives; and
(8) attempting simultaneous action upon the enemy to the entire depth of his deployment and upon objectives deep in his rear.

There are three basic types of 'operation' by which the Ground Forces might seek to implement the requirements of Soviet military art to defeat an enemy such as the NATO forces in Western Europe;

Above: **The retro-rocket para-braking system is clearly seen in this photograph. It enables heavy loads to be air-dropped without damage**

(1) an encirclement: the delivery of two main attacks, or one main and one subsidiary attack, to converge on and encircle the enemy forces, subjecting these encircled forces to assault and bombardment from all directions and preventing their reinforcement while continuing the main offensive deep into the enemy's rear;
(2) an attack along axes: the delivery of one or more frontal attacks on the enemy's defensive position and advancing deep into his rear, to destroy rear installations and reserves moving up, at the same time developing the attack sideways to attack defending forces from the flank or rear; and
(3) single concerted thrust to push the enemy back along the whole front and squash him against a natural obstacle such as the sea or a mountain range.

The Soviets accept that in modern war a superiority in the order of 3 or 4: 1 at least is desirable if an attacker is to have a good likelihood of success, and that a 7 or 8: 1 superiority is even better because it doubles the chance of a quick victory. However, in key areas where the Soviet Army might be employed, e.g. Western Europe or Soviet Central Asia, the USSR cannot at present achieve even a 3: 1 superiority in men and equipment over the whole front. (While such a superiority is possible on, for example, the flanks of NATO, these areas would not be of major strategic importance to the USSR in the event of a general war, and therefore they are not discussed in detail at this point).

As the third example of an 'operation' above, involving as it does a push along the whole front, would therefore require overall superiority of at least 3: 1 and desirably double that, it is unlikely to be the operation chosen under present conditions for a campaign against China or the central front of NATO.

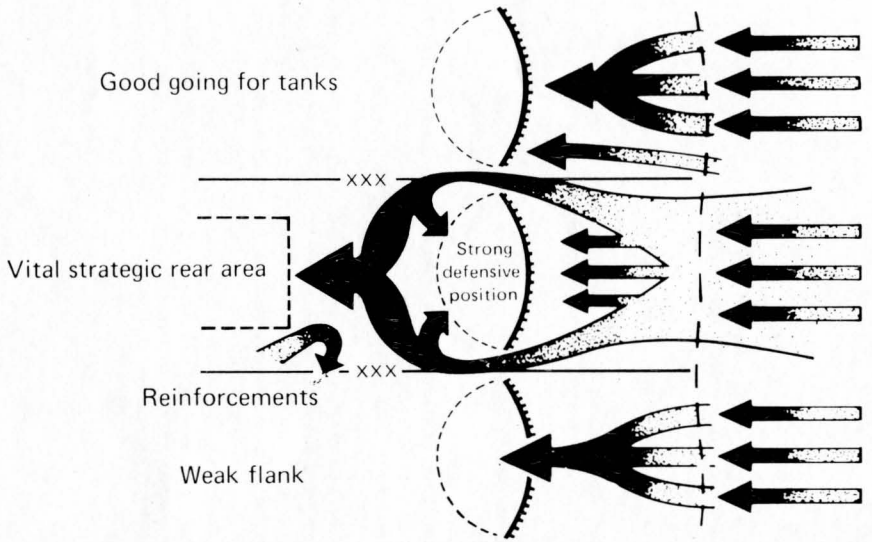
The other operations, both the encirclement and the attack along axes, do not require overall superiority, but achieve their effectiveness by the attainment of overwhelming local superiority in the order of 8 or 10: 1 to smash through or around the enemy defences, and break through into his 'soft' rear area where they can do a disproportionate amount of damage. While overall superiority in men and equipment is highly desirable for these operations, Soviet strategists do emphasise that if the operations are carried out skilfully, using the proper tactics, success can be achieved by an attacking force equal in size to the defending force or, in extreme cases, even inferior in terms of manpower. (It does seem extremely unlikely that the Soviet Army should even have to consider the likelihood of fighting a European enemy which has superior numbers of men.)

By the speed of the advance into enemy territory that both these operations entail, they do offer the best possible medium for a successful offensive force to penetrate to the economic heart of an enemy nation and occupy or neutralise it, thus bringing the war to a speedy conclusion.

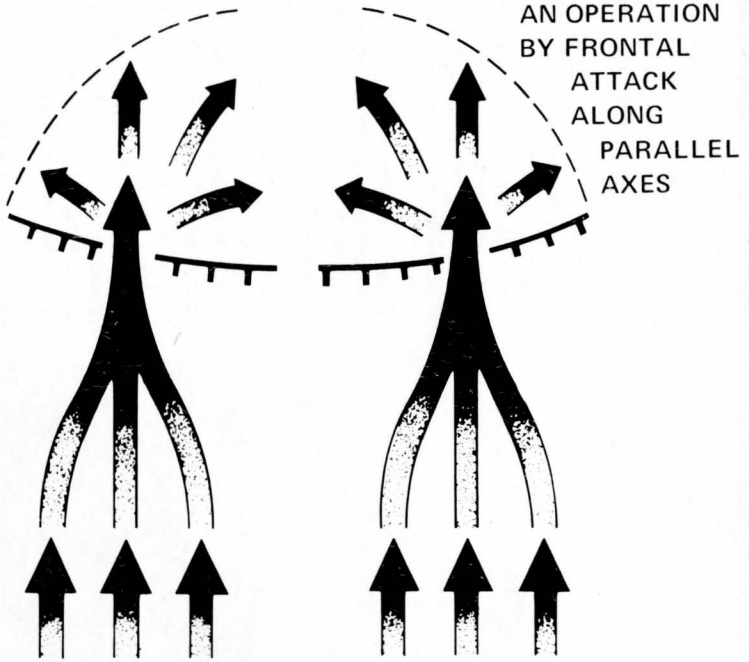
The key to the success of the operations is an effective break-through of the main enemy positions, either directly or around the flank, and it is particularly interesting to

SOVIET BATTLE TACTICS

AN ENCIRCLEMENT OPERATION

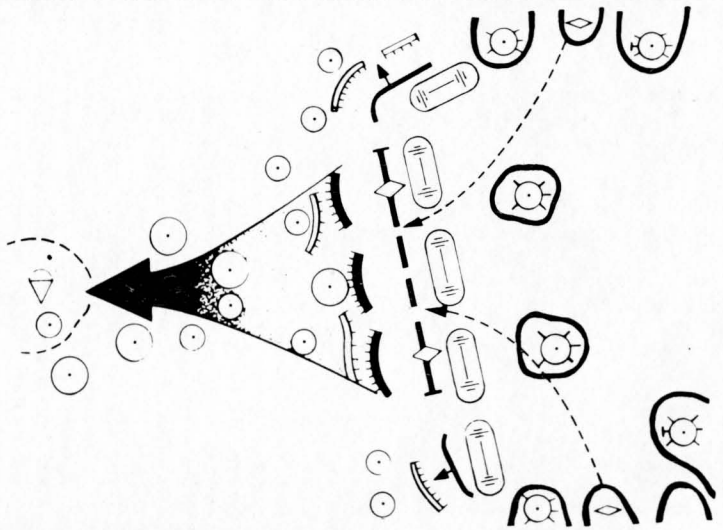


AN OPERATION BY FRONTAL ATTACK ALONG PARALLEL AXES



CONCENTRATION

Though a division might advance on a frontage of 3–5 miles, it would concentrate to 1/3 this at the point of break-through of an enemy defensive position.



- Tactical missile
- Artillery group
- Armoured formation
- Defensive position
- Tactical nuclear strike
- Attacking units

Above: **The BTR 60PB APC is used to carry troops of the Motor Rifle Divisions, whereas tank divisions use the BTR 50P or BMP**

Left: **Soviet parachutists on exercise. Drops are seldom made from below 1,500 feet and, in war, it is unlikely that more than a battalion of paratroops would be dropped at a time**

study the Soviet principles of military art enumerated above in the light of such a break-through.

A diagrammatic representation of such a break-through, taken from Soviet sources, is given. From a study of information supplied by the many means of reconnaissance available to him, the Front commander will select the area or areas for concentration and break-through, paying particular attention to finding suitable terrain for the movement of large armoured forces. Making every effort to conceal his intentions, he will attempt to achieve surprise, and if possible to catch the enemy before they have even taken up their defensive positions. The four or five divisions of the army allotted the task of accomplishing the break-through, or at least of acting as the first wave of the assault, would approach the appointed area well dispersed in extended march column to concentrate only on the objective itself. As the leading elements of the army reach the enemy positions, they will immediately engage them to test their strength, and to give cover to the following main forces, approaching rapidly, a heavy air and artillery bombardment into the very depths of the enemy's defensive position (with either conventional or nuclear and chemical shells depending on a political decision at higher level) would be laid down very rapidly. On the heels of this the main forces of the army would advance at speed on a width of front of perhaps only 12½–20 miles, to overwhelm the defences and break through into the flanks or rear of the enemy position.

So as to lessen their vulnerability to enemy counter-strikes, especially under nuclear conditions, the Soviet divisions would deploy in balanced or armour-heavy battle groups of regimental size. These would themselves be divided into three or four battalion groups with a high degree of linear separation – a division might advance on one or two axes on a front of only five or six miles but extended to a depth of up to 30 or more miles. Concentration would be achieved as each successive regimental group was fed into the battle, advancing rapidly in march columns and only deploying when approaching the area of fighting. At every tactical and operational level it is Soviet practice to make attacks in two echelons. The task of the first echelon, normally one-half to two-thirds of the force involved, with all the armour available and all artillery support, is to break through the enemy defences. The second echelon forces then exploit this breach and pass on into the depths of the enemy position to complete the destruction and engage the enemy reserves before they can reinforce the defenders or organise a second line of defence.

When we study the pattern of deployment in greater detail, we see that within the battalion, vehicles would move 25–50 yards apart in a long crocodile.

The divisional commander commands his long crocodile by a complex radio net from a forward command and observation post well up with the first regiments. This command element will be a fairly small organisation, composed of only the commander, a few assistants and his communications vehicles (with, of course, the ubiquitous AA defence). The division is controlled by the HQ, under the command of the chief-of-staff, who has a large number of deputies to assist him. His job is to organise and control the division in accordance with the commander's orders, leaving the divisional commander free to plan the battle. This HQ is a large organisation; and, being both essential and vulnerable, will not travel so far forward as the commander himself does, but probably will move ahead with the second echelon regiments. Organisation of the rear, and logistic supply, is done from a rear HQ element, commanded by the deputy commander for the tail. This HQ element moves behind the fighting troops. Command and control does not pass from one element of the HQ to the other; but all elements exercise their function continuosly, so some provision must presumably be made for shadow command and main HQ elements to take over if the commander and staff are knocked out.

Speed of advance is achieved by march in column, when not in direct contact with enemy troops. The axes of the advance will be planned to make the best possible use of good ground for rapid movement and good road networks. A division would advance probably on two axes, up to two miles apart. Although the divisional front of responsibility might be up to 10 miles wide, the division would not be spread out over the whole distance, but concentrated over perhaps only one-third of this, with reconnaissance and flank protection sub-units covering the extra ground.

The division would march in regimental groups (motor-rifle or tank regiments plus elements of divisional artillery and engineers), each of which would deploy a strong battalion as an advance guard, and even further forward or on threatened flanks strong companies as march security patrols. Reconnaissance patrols would scout the area in front of and between the marching units. Each marching battalion would attempt to keep just over one mile distant from its neighbour to avoid presenting a juicy nuclear target.

Having located the enemy and ascertained their strengths and positions, by battle if necessary, the strong reconnaissance elements would pass the information back to the divisional advance guard before attempting to push on into the enemy rear, and then continue their advance with the special task of locating subsequent enemy reserves. The advance guard will engage the enemy with the purpose either of destroying him and thus obviating the need for the main forces of the division to deploy unnecessarily and thereby waste valuable time; or, if the enemy

is in great strength, of sacrificing itself in a delaying or diversionary action to give the divisional commander time to deploy his forces from the line of march into battle formation. The regimental groups will normally deploy with two battalion groups of mixed armour and infantry in the first echelon and one battalion group in the second echelon, with engineers and artillery in close support. The task of the first echelon is to defeat the enemy's main forces, whereupon the second echelon will exploit their success, break through into the enemy rear and engage the enemy reserves.

Soviet tactical doctrine lays great stress on the desirability of speed and rapid manoeuvre, and emphasises that it far preferable not to have to attack a prepared enemy defence, where the attacker needs superiority of forces, but rather to attack his troops while the latter are still on the march. This tactic is known as the encounter battle. When the reconnaissance units of the advancing Soviet forces give warning of an enemy force advancing towards them, the Soviet advance guard will engage the enemy advance guard, and the Soviet main forces would then hope to manoeuvre and, deployed in platoon columns 100 yards apart, to attack the advancing enemy in the flank while still on the move, giving him no chance to prepare a defence. Thus the odds would be even in a very fluid battle, and by dint of careful planning, surprise and the attacking of the enemy along the whole depth of his formation at the same moment, the Soviet forces would hope to wrest a victory without numerical superiority.

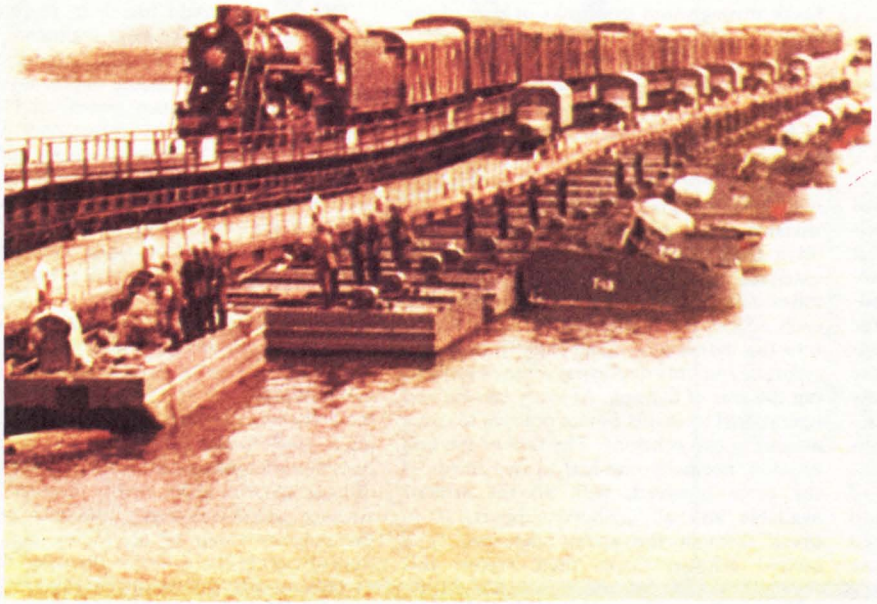
Although the Soviet Ground Forces consider fighting a war only by means of the offensive and counter-offensive, they by no means ignore the tactics of defence, accepting that enemy counter-attacks might well throw them on to the defensive at very short notice. A diagram of a classic Soviet defensive position is also shown. Of particular significance is the positioning of the defence in two echelons, with good communication and flank cover, and the massing of a mobile counter-offensive force to meet the enemy should he break through, and to seize the initiative and counter-attack at the first possible moment.

Such tactics as are described above are extremely demanding of an army, and necessitate not only a high degree of co-ordination and control and well trained officers and men, but also first-class units and formations suitably organised and equipped to fight such highly intensive mobile engagements. As our study of the Soviet Ground Forces has shown, in organisation, equipment and training they do indeed attempt to fulfil these operational requirements and this is why they differ in several marked respects from the armies of many NATO states.

All the tactics and operations discussed so far are seen by the Soviets as being equally applicable to wars fought in a conventional environment or using weapons of mass destruction (the Soviet term for nuclear and chemical weapons). In conventional conditions, greater concentration is possible than in conditions where nuclear weapons might be used, and a slower overall rate of advance would be expected on a non-nuclear battlefield: 15–20 miles per day instead of 25–30 miles.

The Soviets have a very significant cap-

Below: **Rail communications are essential to Soviet stretegic re-supply plans in a prolonged war. This pontoon bridge can be constructed in a few hours.**



SOVIET BATTLE T

KEY

An apc or apc unit (eg. motor rifle company)

A tank or a tank unit

A gun or artillery unit

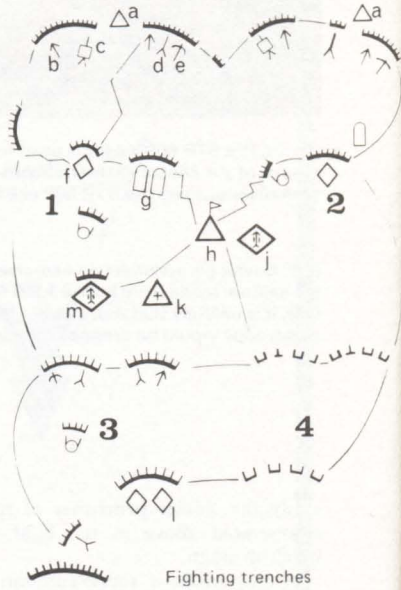
Anti-aircraft artillery

(a) Strong recce patrol eg. BRDM BMP T62 motorcycle
(b) & (c) The Vanguard
- (b) Recce vehicle (BRDM)
- (c) Vanguard consisting of a Motor rifle coy (10 apcs) plus a tank platoon (4 tanks)

(d) – (p) Main Forces
- (d) Recce vehicle
- (e) Bn HQ
- (f) SP anti-aircraft guns (2 x ZSU 23-4)
- (g) Tank platoon
- (h) Tank platoon
- (i) Motor rifle coy (10 BMP)
- (j) Motor rifle coy (10 BMP)
- (k) Engineer vehicle
- (l) Artillery platoon 2-3 SP guns
- (m) Artillery platoon 2-3 SP gur
- (n) Rear service vehicles
- (p) Flank guard – (BMP or BRD

(q) Rearguard – (BMP or BRDM)

BATTALION DEFENSIVE POSITIO



Fighting trenches

Communication trenches

Prepared but unoccupied trenches

(a) Observation post
(b) Machine gun
(c) Anti-tank missile launcher (Sagger)
(d) Anti-tank grenade launcher (RPG-7)
(e) Heavy machine gun
(f) Dug in tank
(g) APCs giving fire support
(h) Bn HQ
(j) Anti-aircraft tank (ZSU 23-4)
(k) Medical post
(l) Tanks for counter attack
(m) Mortars

1 & 2 – Company positions – 1st echelon of defenc

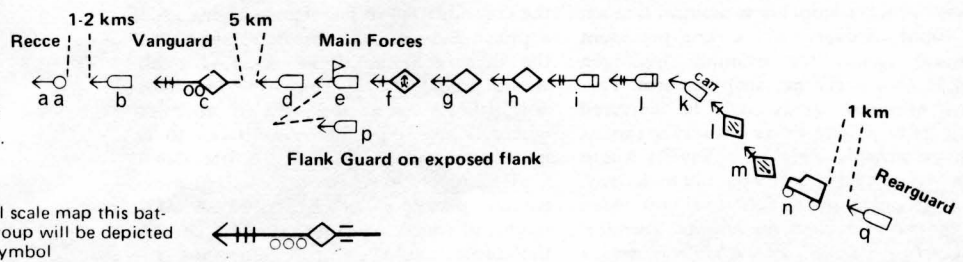
3 – Company pos tion – 2nd echelo an expected (left flank) axis of ene attack

4 – Reserve positi in case main attac is on right flank

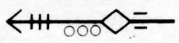
TICS: March-March to attack-Defense-Encounter battle

MARCH ORDER

Soviet military map symbols depicting a motor-rifle battalion group on the march. This march order is adopted when an encounter battle is anticipated and rapid deployment will be necessary.

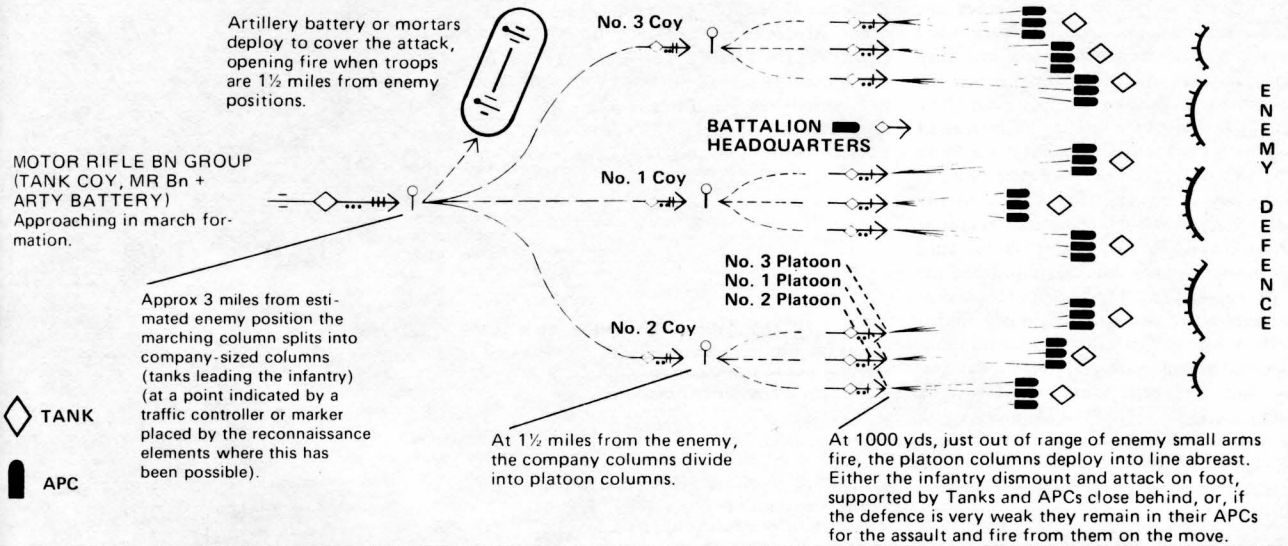


On small scale map this battalion group will be depicted by the symbol



A BATTALION'S DEPLOYMENT FROM THE MARCH TO THE ATTACK -- BASIC DRILL

A Battalion group would normally attack in one line (or echelon) as indicated here, with another battalion group of the same regiment close behind the second wave of the attack.

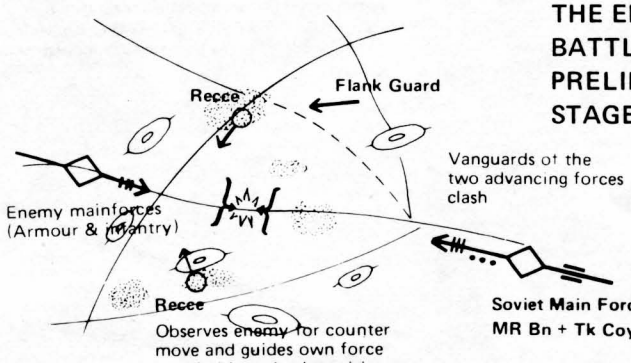

Artillery battery or mortars deploy to cover the attack, opening fire when troops are 1½ miles from enemy positions.
No. 3 Coy
BATTALION HEADQUARTERS
No. 1 Coy
No. 3 Platoon
No. 1 Platoon
No. 2 Platoon
No. 2 Coy
ENEMY DEFENCE
MOTOR RIFLE BN GROUP (TANK COY, MR Bn + ARTY BATTERY) Approaching in march formation.
Approx 3 miles from estimated enemy position the marching column splits into company-sized columns (tanks leading the infantry) (at a point indicated by a traffic controller or marker placed by the reconnaissance elements where this has been possible).
TANK
APC
At 1½ miles from the enemy, the company columns divide into platoon columns.
At 1000 yds, just out of range of enemy small arms fire, the platoon columns deploy into line abreast. Either the infantry dismount and attack on foot, supported by Tanks and APCs close behind, or, if the defence is very weak they remain in their APCs for the assault and fire from them on the move.

The **encounter battle** is a tactic much favoured by the Soviet Army. When the enemy is occupying a prepared defensive position, superiority in the order of 5:1 will probably be needed to destroy him. An encounter battle occurs when Soviet forces, moving forward rapidly, meet an enemy force advancing in a counter move. In such a case it is clearly in the interests of the Soviets, in the role of attacker, to engage the enemy whilst he is still on the move. Thus, battle is between two totally mobile forces, and no time is available for defensive positions to be occupied. This effectively evens the odds, and the Soviets believe that by careful manoeuvre they should be able to overwhelm an opponent of equal size very quickly. This is particularly true if the opponent is equipped with British or US AFVs which are much less suited to this type of battle on the move than are the Soviet vehicles. The stages of an encounter battle are as follows:

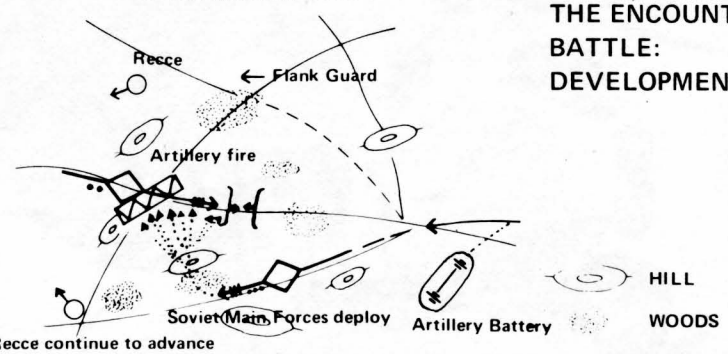
The recce elements of the advancing Soviet column locate an advancing enemy and the Soviet advance guard engages the enemy vanguard. As the enemy main forces advance to assist their hard-pressed van, the Soviet main forces abandon their advance guard and execute a flanking manoeuvre under the guidance of their own recce. They are thus able to attack the marching enemy column from the flank, following a short artillery barrage from their attached battery (which would deploy at first contact). Travelling at high speed, the deployed Soviet unit will drive right into the enemy column, and a fierce fire fight at pointblank range will ensue.

The Soviets consider that such an encounter battle is the most decisive means of achieving tactical victory, as the side which is defeated will be totally destroyed; so much so that there is no Soviet drill for recovery from defeat in an encounter battle!

THE ENCOUNTER BATTLE: PRELIMINARY STAGES


Recce
Flank Guard
Vanguards of the two advancing forces clash
Enemy mainforces (Armour & Infantry)
Recce
Observes enemy for counter move and guides own force to suitable ambush position
Soviet Main Forces
MR Bn + Tk Coy + ARTY BTY

THE ENCOUNTER BATTLE: DEVELOPMENT



acity for fighting with weapons of mass destruction. They are known to hold stocks of persistent and non-persistent chemical agents for their artillery. The BM-21 multi-barrelled rocket-launcher is an ideal weapon for rapid delivery of a non-persistent chemical agent, for example hydrogen cyanide or a nerve gas such as sarin. Persistent chemical agents could be delivered by air strike or long-range artillery to targets such as airfields which the Soviets might want to deny to the enemy but not to destroy. Soviet commanders at field level and above are taught to regard the use of chemical weapons as a matter of course – simply a weapon available to them which will be used when tactical and meteorological conditions permit.

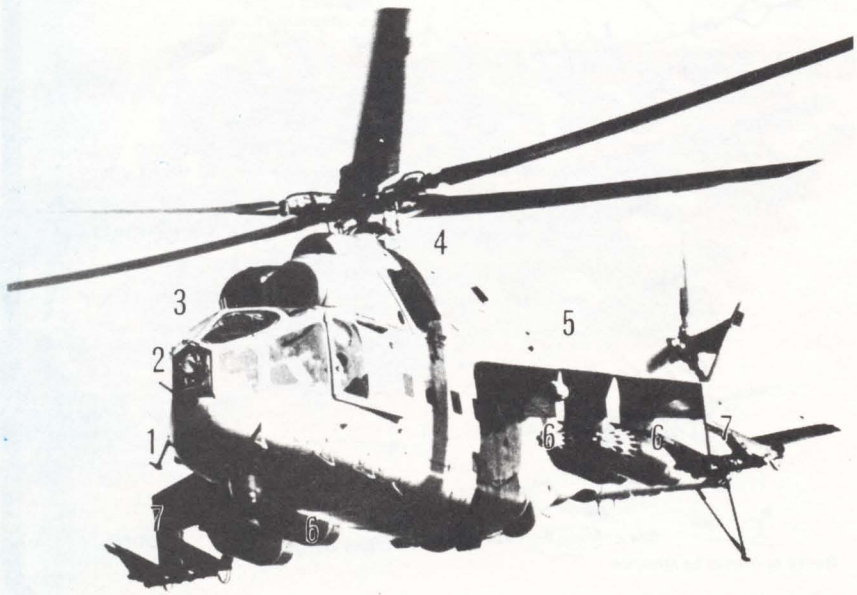
Although political considerations are likely to determine whether or not battlefield nuclear weapons are used, if they are released, then they too are simply regarded for tactical terms as replacing a large artillery barrage; and commanders must expect to take their use in their stride. Whether their battlefield systems will in fact be capable of dealing with nuclear devastation on a large scale is impossible to say, but the Soviets certainly pay more than lip service to the necessity for planning for such an eventuality. All reconnaissance units in the Ground Forces have elements specially equipped for duty in contaminated areas. Each soldier has protective clothing, a respirator and a personal decontamination kit. Decontamination sprays are held at company level and above, and divisions have complex mass decontamination equipment such as the TMS 65 – a jet engine mounted on a lorry which sprays activated bleach slurry to decontaminate armoured fighting vehicles (AFVs).

The Soviet Ground Forces are also widely equipped with passive and infra-red night-vision devices and battlefield surveillance radar, although many Western specialists consider these to be less effective than some possessed by NATO forces. Soviet doctrine insists that pressure on the enemy must be maintained at night, but it is unlikely that the advance would be continued at daytime pace. Cover of darkness would be used for the consolidation of positions, moving up of supplies and preparation for resumption of the advance at first light. River crossings would probably be attempted at last light, and bridges built and crossed at night wherever possible to enable attacks to be launched from bridgeheads before dawn. Certain operations, such as deep-penetration paratroop or heliborne assaults, might, of course, wait for darkness because the protection it affords outweighs the difficulties of operating in the dark.

As rivers and canals constitute perhaps the major geographic obstacle to any attack on Western Europe, it is not surprising that the Soviets have equipped their army with extremely effective river-crossing equipment. Moreover, with the minimum of preparation, their tanks can be prepared for schnorkelling where the river banks and bed are suitable. All their APCs are fully amphibious, and divisions are well supported with amphibious cargo vehicles

Right: **A BTR 60 in difficulties. Although it has good swimming characteristics, this wheeled vehicle needs a very gentle slope if it is to climb out of the water when loaded**

Below: **The Mi-24 Hind is the first Soviet helicopter gunship. Fire support during assault landings is its primary role. (1) Pitot head. (2) 12.7-mm machine gun. (3) Perspex bullet-proof shield. (4) Engine exhaust. (5) Laser rangefinder on gun camera mount. (6) Pods holding 32 57-mm unguided rockets. (7) Rails for Swatter semi-automatic ATGW**



capable of carrying supplies and weapons.

The Soviets do not maintain units solely for warfare in special conditions such as desert, mountain and snow. The entire army is expected to be able to fight in all climatic conditions – and in view of the extremes of climate in the USSR this is hardly surprising. Those units stationed in mountainous or desert areas practise the same tactics and operations with the same equipment as does the army as a whole. Tactics will be adapted to accommodate the difficult conditions where necessary, but in practice Soviet units seem to make few concessions to difficult terrain.

Chemical warfare

One area in which, it is generally agreed, Soviet military technology leads the West is chemical warfare. From the establishment in the 1920s, with German help, of a gas warfare school, the USSR has continued to develop her CW capability. Chemical weapons are considered a most effective means of waging war; indeed, the USSR sees herself as being particularly vulnerable to their strategic use.

Along with nuclear weapons, chemical and bacteriological weapons are classed by the Soviets as "weapons of mass destruction". Although bacteriological warfare is under international interdict, there is no doubt that the USSR has conducted a great deal of research in this sphere too.

The Soviet Armed Forces of today are trained to accept the use of chemical weapons as a matter of course. Soviet officers make an intensive study of the special conditions of chemical warfare on their Staff courses. Chemical phases are included in all large Ground Forces exercises and many Naval ones, and are a major feature of most Civil Defence exercises.

Civil Defence

With the possible exception of China, the USSR maintains the largest and most active Civil Defence organisation in the world.

Under the control of Deputy Minister of Defence, the Civil Defence organisation reaches every sector and age-group of the population. Its objectives are, in event of an attack, to prevent panic, to maintain law and order, to maintain agricultural and industrial production, and to ensure organised decontamination to eradicate the effects of any attack.

To these ends, the organisation sets out to teach the Soviet citizen how to protect himself from nuclear, chemical and bacteriological weapons. Instruction is given in schools and universities, in factories and on farms. Large-scale compulsory exercises are organised regularly, involving hospital staff and local government officials as well as thousands of members of the public.

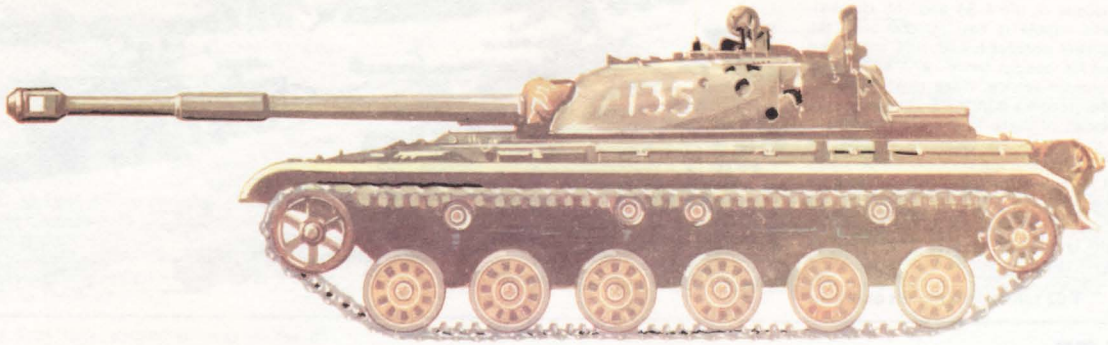
The Civil Defence organisation is responsible for organising the construction of shelters in factories, schools, public buildings and blocks of flats, the evacuation of urban areas and the organisation of emergency services. Naturally the Communist Party plays a major role in the co-ordination of Civil Defence activities, and co-opts the young party organs—the Pioneers and the Komsomol—and the DOSAAF into assisting with their organisation.

It is argued by some that Civil Defence will not be effective in a future war. The Soviet General Staff refute this idea totally, and urge the Party and Government to give the organisation all possible support. Moreover, the Civil Defence organisation provides yet another means of involving the Soviet population in disciplined activity and serves to maintain an awareness of the ever-present "Capitalist Threat" and the need for defence against it.

Above: **A soldier of an NBC defence unit monitors contaminated equipment. The Russians use radio-active material in exercises to provide realistic training**

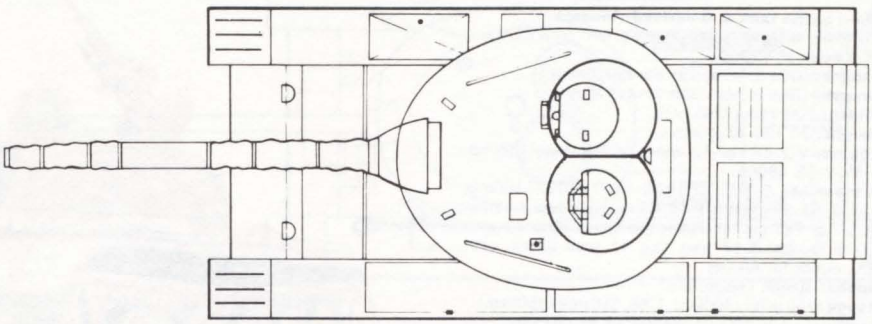
Left: **Chemical defence troops practise decontamination of a road during Exercise Neman in 1968, in preparation for the invasion of Czechoslovakia**

T-72



New battle tank
Combat weight: Estimated at 39·3 tons (40,000kg).
Length: (Gun to front) about 32ft (10m).
Length: (Gun to rear) about 23ft (7m).
Width: About 11ft 6in (3·5m).
Height: Estimated at 7ft 2in (2200mm).
Engine: New engine of unknown type, but expected to be water-cooled diesel of about 900hp.
Armament: New gun reported variously as having calibre of 122mm and of 125mm, with bore rifled at start and smooth thereafter, firing fin-stabilized APDS ammunition from 28-round automatic loader; probably one 7·62mm (co-axial) with large quantity of ammunition.
Speed: Up to 50mph (80km/h).
Range: Probably about 310 miles (500km).
Armour: Probably up to 120mm (more on mantlet), possibly of modern type resistant to shaped charges.

Observers in the West have suggested that the new turret of the T-62 was probably intended to be fitted to a new chassis which was not ready in time. Continued progressive development led, by way of a reported T-67 with the T-62 turret, to today's new main battle tank now equipping armoured divisions of the Soviet and other Warsaw Pact forces. Its designation has been reported to be T-64 and also T-72 (the latter was accepted in the UK and USA at the time of writing), and it is certainly an extremely formidable tank able to outgun and out-fight any Western tank except the British Chieftain. The completely new chassis has small wheels and return rollers, a new engine and transmission, and low-flash fuel stowage as protection on each side. The heavily armoured turret incorporates a superb new gun with mechanical loading. This has allowed the crew to be reduced from four to three, with the commander and gunner seated high in the turret with no need to attend to the main gun. The very latest IR, laser-ranging and NBC equipment are certain to be fitted, and it is reported that driver fatigue has been greatly eased by reducing engine vibration and driving work-load. Road speed is remarkable.

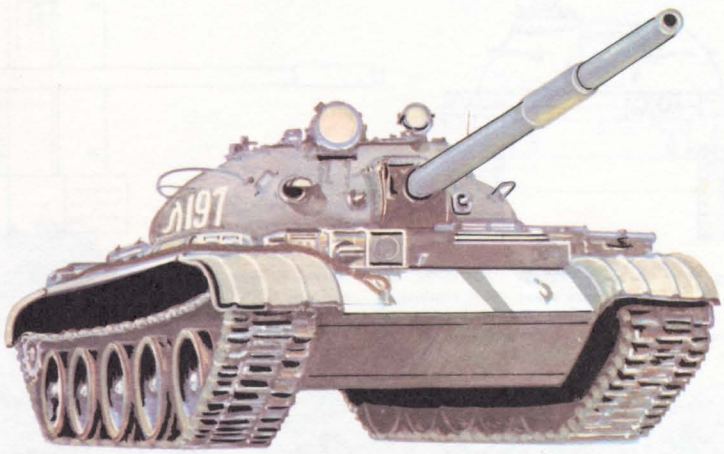


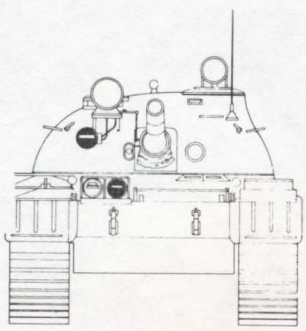
Above: **Drawings represent 'development' T-72 with different guns**

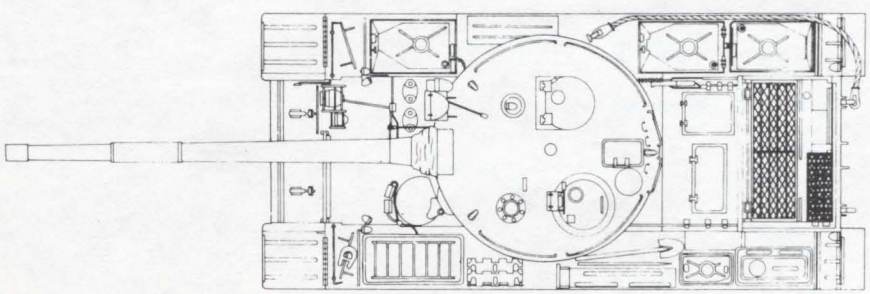
T-62

Main battle tank
Combat weight: (Fully stowed, no crew) 36·93 tons (37,500 kg).
Length: (Gun to front) about 30ft 8in (9488 or 9770mm).
Length: (Gun to rear) 22ft (6705mm).
Width: Close to 11ft (3352mm).
Height: 7ft 11in (2400mm).
Engine: V-2-62 vee-12 water-cooled diesel, 700hp.
Armament: U-5TS 115mm smooth-bore gun, 40 rounds; one 7·62mm (co-axial) with 2,000 or 3,500 rounds.
Speed: Up to 34mph (55km/h).
Range: Typically 310 miles (500km).
Armour: Up to 100mm, mantlet up to 170mm.

Again the Soviet designers found the existing (T-55) design almost impossible to better. The T-62 follows exactly the same formula but with a slightly bigger hull housing more power and some extra equipment, and with an outstanding smooth-bore gun firing fin-stabilized ammunition. The bigger gun, with evacuator







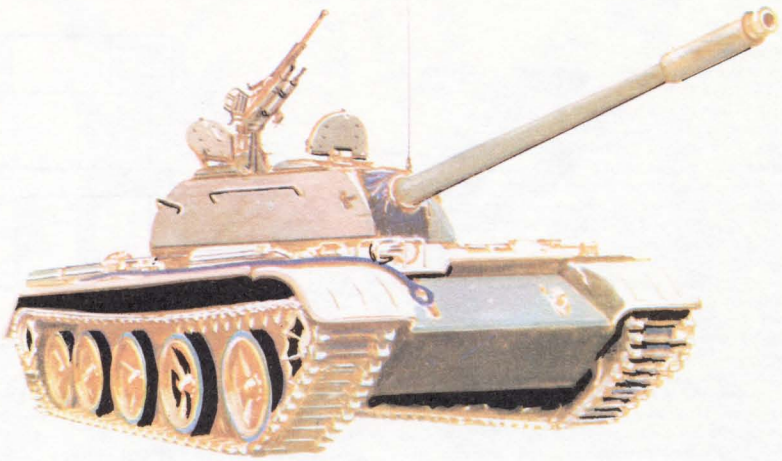
well back from the muzzle, is an identification feature, as are the close-spaced three front pairs of road wheels (the opposite of the T-54 and -55 chassis). The commander's cupola is cast integral with the turret, and equipment includes full IR, NBC protection and deep snorkel for wading. Since 1973, eight years after the T-62 entered service, these tanks have appeared with laser ranging and a 12·7mm AA gun. Numerous examples of these formidable tanks have been supplied to at least six countries outside the Warsaw Pact. It will remain the principal Soviet battle tank until about 1978, when T-64 (T-72) numbers are likely to overtake it.

Major faults: poor gearbox, liability to shed tracks, thin armour and vulnerable ammunition and fuel storage; poor crew operating conditions.

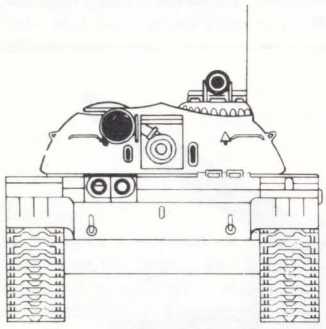
T-62 tanks on a recent exercise

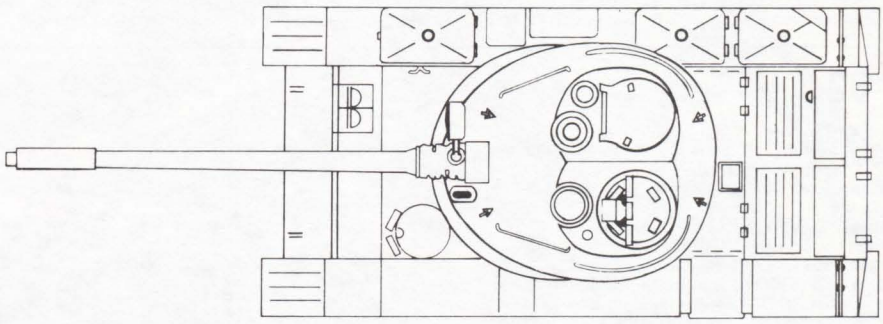
T-54, T-55

Main battle tank and derived vehicles
Combat weight (fully stowed, no crew): About 35·9 tons (36,500kg).
Length: (Gun to front) 29ft 7in (9020mm).
Length: (Gun to rear) 21ft 7in (6570mm).
Width: 10ft 9½in (3265mm).
Height: 7ft 10in (2380mm).
Engine: V-2-54 vee-12 water-cooled diesel, 520hp; T-55, V-55, 580hp.
Armament: D-10T, D-10TG or D-10T2S 100mm gun (T-54, 34 rounds, T-55, 43 rounds); two 7·62mm SGMT or PKT machine guns (co-axial and bow) with 3,000 rounds; T-54 also one 12·7mm DShK with 500 rounds for AA use.
Speed: 30mph (48km/h).
Range: 250 miles (400km); T-55, 310 miles (500km).
Armour: Up to 100mm, mantlet up to 170mm.



The Soviet tank designers found it hard to improve on the T-34/85, the T-44 of 1945 introducing an improved chassis but having the old turret. In 1947 the T-44 chassis reappeared with a new elliptical turret mounting a 100mm gun, and the resulting T-54 became the standard Soviet-bloc battle tank (much



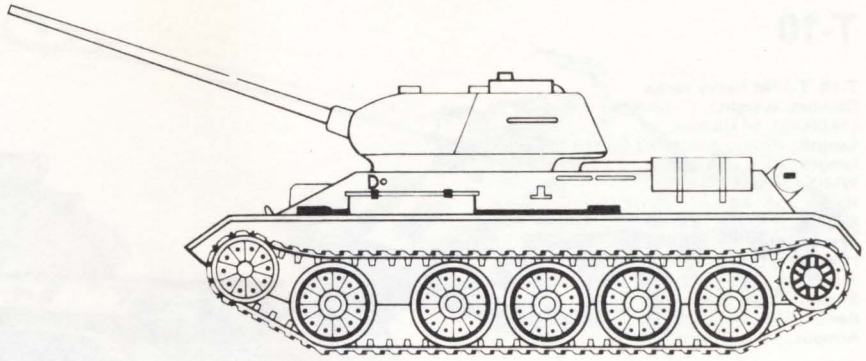


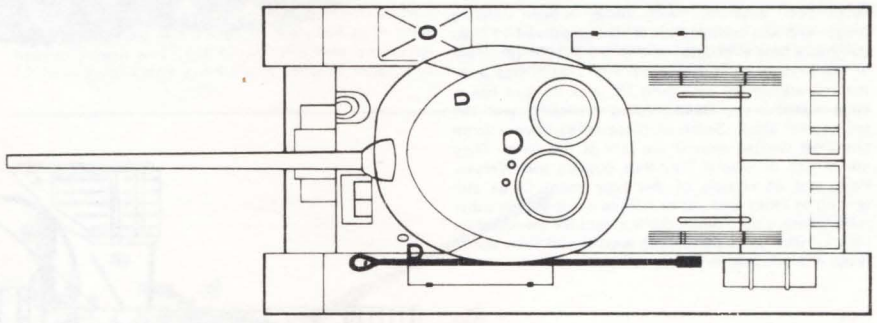
faster and more compact than Western tanks, but cramped inside). There were seven main production versions, some built in Poland, Czechoslovakia and China. The T-55, built in even greater numbers, appeared in 1961. This has slightly more power, a revised turret with more ammunition and no AA gun, and very tall snorkel tube for deep wading. Most tanks of these series have been progressively fitted with IR night equipment, stabilized gun and provision for NBC-contaminated environments. They are used by all Warsaw Pact armies, in tank, bridgelayer, flamethrower, mine-clearing, recovery and dozer versions, and also by about 25 other countries.

Major faults: as for T-62, plus obsolescent main armament.

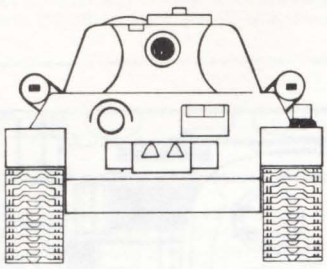
T-34/85

Medium tank and many derived vehicles
Combat weight: (Fully stowed, no crew) 32 tons (31,500kg).
Length: (Gun to front) 26ft 6in (8076mm).
Length: (Gun to rear) 20ft 4in (6190mm).
Width: About 10ft (2997–3050mm).
Height: About 8ft 6in (2680–2743mm).
Engine: Usually V-2-34 or -34M vee-12 water-cooled diesel, 500hp.
Armament: M-1944 85mm gun, 56 rounds; DT or DTM 7·62mm machine guns (co-axial and bow) with total of 2,394 rounds.
Speed: Up to 34mph (55km/h).
Range: Up to 190 miles (300km).
Armour: Up to 75mm (2·95in).





The original T-34 tank, derived by way of the BT Cruiser from the American Christie T.3 of 1931, is widely regarded as the best all-round tank of its age,

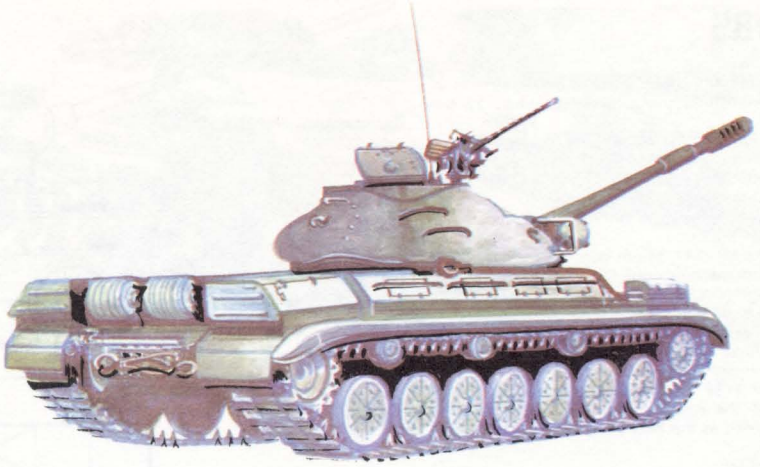


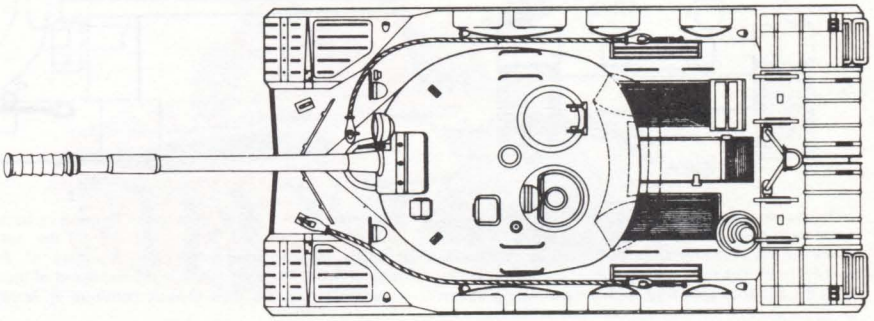
with great speed, firepower and armour. In 1941, when it had been in production just a year, it proved a severe shock to the invading Germans, who discussed the possibility of making a copy themselves. In December 1943 the T-34/85 appeared, with a hard-hitting 85mm gun (instead of 76mm) in a larger three-man turret. Production continued long after 1945, the total possibly rivalling the astronomic numbers of the original T-34/76. Even today many thousand of these excellent tanks and their chassis continue in service in many nations. The chassis is used for the SU-85 and SU-100 (p.188), and other special purpose vehicles for engineering, recovery, minelaying, mine-clearing, bulldozing, crane and bridgelaying. At least 20 nations still use the T-34/85 as a medium tank.

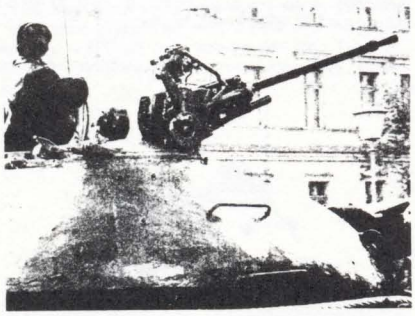
T-10

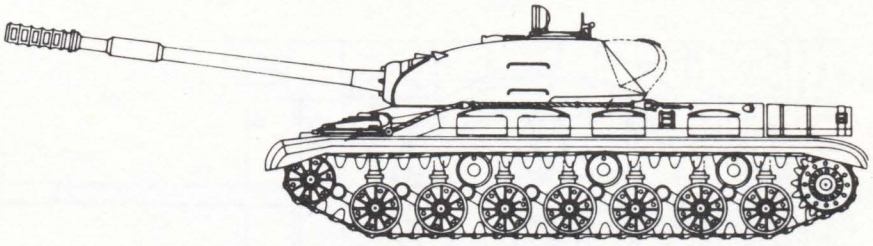
T-10, T-10M heavy tanks
Combat weight: (T-10M, no crew) 48·23 tons (49,000kg), 54 US tons.
Length: (Gun to front) 34ft 9in (10,490mm typical).
Length: (Gun to rear) 23ft 1in (7400mm).
Width: 11ft 8in (3440mm).
Height: (Excl. AA gun) 7ft 5in (2260mm).
Engine: V-10 vee-12 water-cooled diesel, 700hp.
Armament: M-1955 122mm gun, 30 rounds; (T-10M) two 14·5mm KPV (co-axial and AA), 1,000 rounds; (T-10) two 12·7mm DShK, 1,000 rounds.
Speed: 26mph (42km/h).
Range: 155 miles (250km).
Armour: Up to 210mm.

Last of the Soviet 'heavy' tanks, the T-10 family were natural improvements of the IS-III, with a new engine and gun, seven road wheels each side in a revised suspension, new hull with better armour, and a bigger and less cramped turret. The improved 122mm gun has a bore evacuator, and in the T-10M (possibly in the T-10 also) is stabilized. The T-10M has augmented equipment including IR, and its gun has a large muzzle brake. Deep wading is possible with the tall snorkel stack. Some of these tanks have a large container welded around the rear of the turret. They are in use in several countries outside the Warsaw Pact, and all chassis of this type seem to be still serving as tanks and not as missile carriers or in other roles. There is no modern replacement for the obsolescent T-10M, as its ponderous weight and slow speed make it unsuitable for offensive operations.

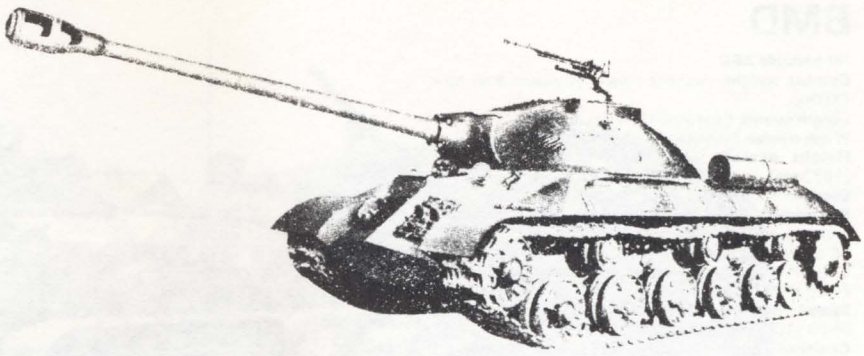








IS (JS)



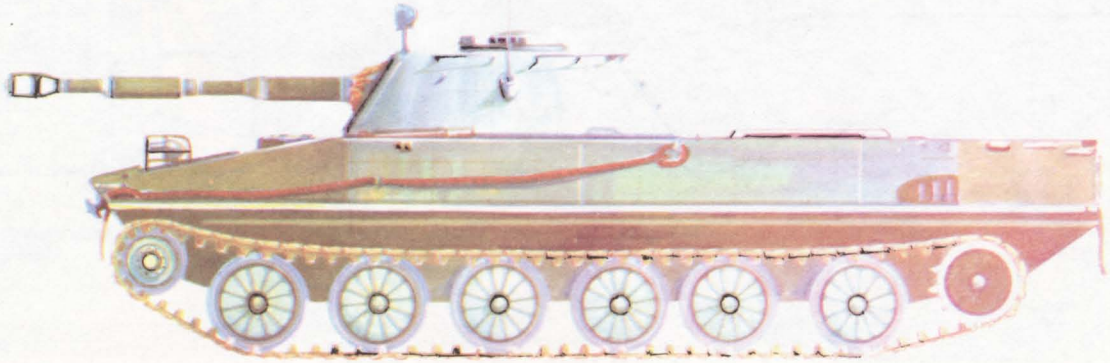
IS-II, -III and -IV heavy tanks
Combat weight: (Fully stowed, no crew) 45·2–45·8 tons (46,000–46,500kg).
Length: (Gun to front) 32ft 9in (9980mm).
Length: (Gun to rear) 22ft 4in (6800mm).
Width: 10ft (3050mm).
Height: (Excl. AA gun) 9ft (2740mm).
Engine: V-2-IS vee-12 water-cooled diesel, 520hp.
Armament: M1943 (D-25) 122mm gun, 28 rounds; DTM 7·62mm co-axial, 2,000 rounds (JS-2, three DTM, bow, co-ax and rear); 12·7mm DShK for AA use.
Speed: 23mph (37km/h).
Range: 112 miles (180km).
Armour: Up to 120mm (JS-2, 132mm).

The standard heavy tank of the ground forces in June 1941 was the KV-1 (Klimenti Voroshilov), first used in Finland in 1939. Though heavily armoured it lacked the T-34's good shape, and had only the same 76mm gun. By late 1941 lead-designer Kotin had transformed this into the JS-1 (Josef Stalin), with 85mm gun, followed in early 1944 by the JS-2 (now called IS-II) with 122mm gun, and in January 1945 by the excellent JS-3 (IS-III) with squat sloping profile. Small numbers were built in the late 1940s of the JS-4 with even heavier armour and more power, and with a co-axial 12·7mm gun. Large numbers of IS-type tanks and derived vehicles remain in service, the chassis being used in the 'Scud A' and 'Scud B' missile systems, the 'Scamp' and 'Scrooge' ICBM systems, the ISU-122 and -152 assault guns, the 'Frog 1' tactical rocket system, several obsolescent SP guns and large mortars, and a variety of recovery and other engineer vehicles.

PT-76

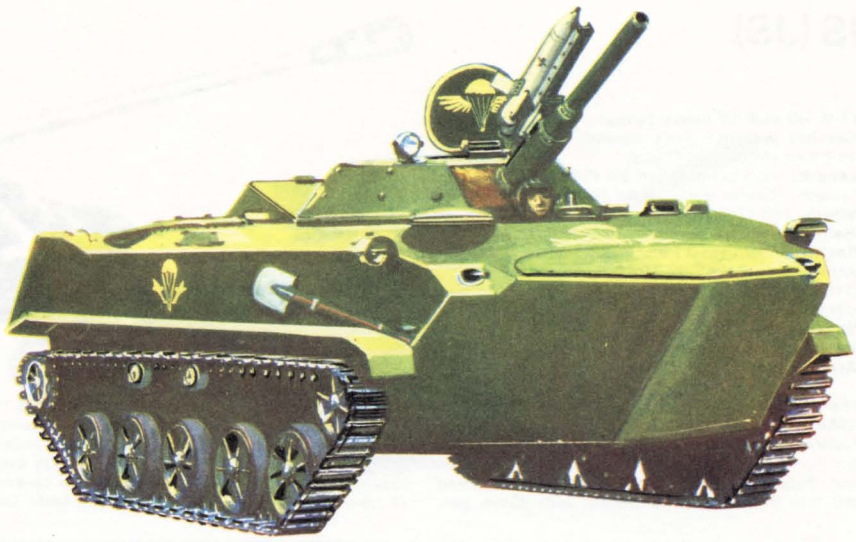
PT-76 (three models) amphibious light tank and derivatives
Combat weight: (No crew) 13·78 tons (14,000kg).
Length: (Gun to front) 25ft 0in (7625mm).
Length: (Gun to rear) 22ft 7in (6910mm).
Width: 10ft 5in (3180mm).
Height: 7ft 5in (2260mm) (early models, 2195mm).
Engine: V-6 six-in-line water cooled diesel, 240hp.
Armament: 76mm gun (D-56T, multi-slotted muzzle brake, PT-76-I; D-56TM, double-baffle brake plus bore evacuator, Model II; unknown gun designation, plain barrel, Model III); 40 rounds; 7·62mm SGMT (co-axial), 1,000 rounds.
Speed: 27mph (44km/h) on land, 6¼mph (10km/h) on water.
Range: 155 miles (250km) on land, 62½ miles (100km) on water.
Armour: Usually 11–14mm.

Since it appeared in 1952 this large, lightly armoured but highly mobile vehicle has appeared in at least 15 different guises, and been built in very large numbers. The basic PT-76 (PT-76B when fitted with stabilized gun) is still the most numerous reconnaissance tank of the Warsaw Pact armies. To swim, the twin hydrojets at the rear are uncovered and clutched-in, and a trim board is folded down at the front. Smokelaying equipment is standard. The 76mm ammunition is the same as for the M-1942 (ZIS-3), SU-76 and T-34/76. The PT-76 is used by at least 17 countries outside the Warsaw Pact. Its basic design of chassis is used in the ASU-85, SA-6 Gainful SAM vehicle, BTR-50, FROG-2/-3/-4/-5, GSP bridger, M-1970, OT-62 APC, Pinguin, PVA and ZSU-23-4.



BMD

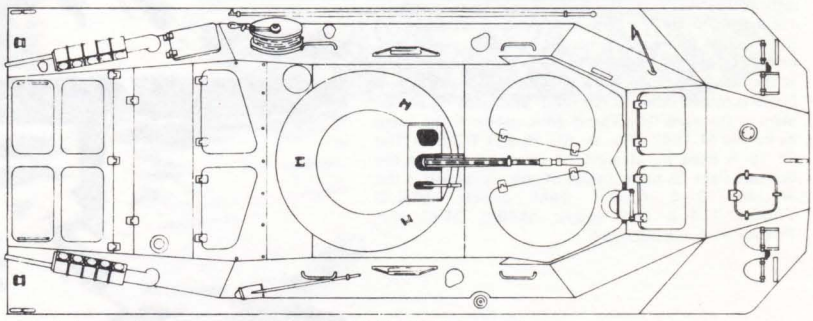
Air-portable APC
Combat weight: (without crew): Estimated 8.86 tons (9000kg).
Length overall: Estimated 17ft 4½in (5300mm).
Width overall: Estimated 8ft 8in (2640mm).
Height overall: (excl. crew or aerials) 6ft 0in (1850mm).
Engine: Possibly a V-6, of about 280hp.
Armament: Turret identical to BMP, with 73mm low-pressure smooth-bore gun with auto-loading, from 30-round magazine, 7·62mm PKT co-axial, and 'Sagger' missile on launch rail. In addition, at least two 7·62mm PKT in mounts in front corners of hull.
Speed: Estimated at least 40mph (65kh/h) on land, 6mph (10km/h) in water.
Cruising range: Estimated 250 miles (400km) on land.
Armour: Probably 20mm.



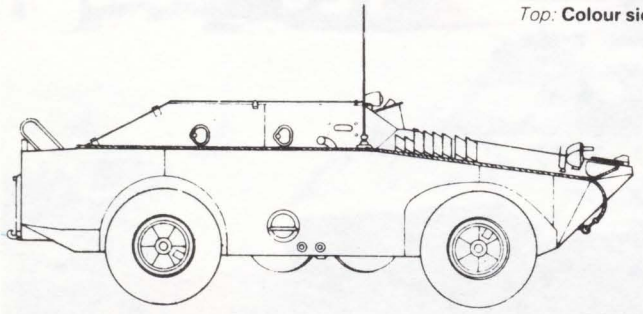
First seen in November 1973, this trim little APC (armoured personnel carrier) is another of the 'quart in a pint pot' vehicles developed primarily for the large and important Soviet airborne forces. Though such aircraft as the An-22 could easily carry the BMP, it was judged the same capability could be built into a smaller and lighter APC capable of being airlifted in greater numbers and more readily dropped by parachute. At first styled 'M-1970' in the West, the BMD (Boyevaya Machine Desantnaya) has a crew of three and carries six airborne infantry in open seats in the back, and not inside like the slightly larger BMP. It operates in water by hydrojet propulsion like the PT-76. It is probably most correctly classified as an airborne infantry combat vehicle.

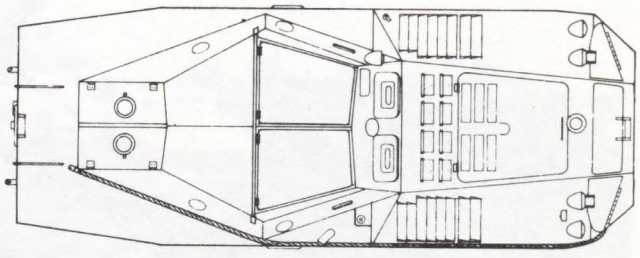
BTR-40/BRDM

BTR-40 family, BTR-40P (BRDM) family and BTR-40PB (BRDM-2)
Combat weight: -40, 5·2 tons (5300kg); -40P, 5·5 tons (5600kg); -40PB, 6·89 tons (7000kg).
Length: -40, 16ft 8in (5000mm); -40P, 18ft 8in (5700mm); -40PB, 18ft (5750mm).
Width: -40, 6ft 3in (1900mm); -40P, 7ft 6in (2285mm); -40PB, 7ft 8½in (2350mm).
Height: -40, 5ft 8½in (1750mm); -40P, 6ft 3in (1900mm); -40PB, 7ft 7in (2310mm).
Engine: -40, GAZ-40, six-in-line water-cooled gasoline, 80hp; -40P, GAZ-40P, 90hp; -40PB, GAZ-41, vee-eight, 140hp.
Armament: Most, 7·62mm SGMB, 1,250 rounds; PB has 14·5mm KPVT turret, 500 rounds.
Speed: -40, 50mph (80km/h); -40P, land 50mph (80km/h), water 6mph (9km/h); -40PB, land 62mph (100km/h), water 6¼mph (10km/h).
Range: -40, 404 miles (650km); -40P, 310 miles (500km); -40PB, 465 miles (750km/h).
Armour: All 10mm.



Top: **Colour side view shows BTR-40PB (BRDM-2); below it is top view of similar version.**





Above: **Side and top views of the BTR-40 (BRDM) reconnaissance vehicle**

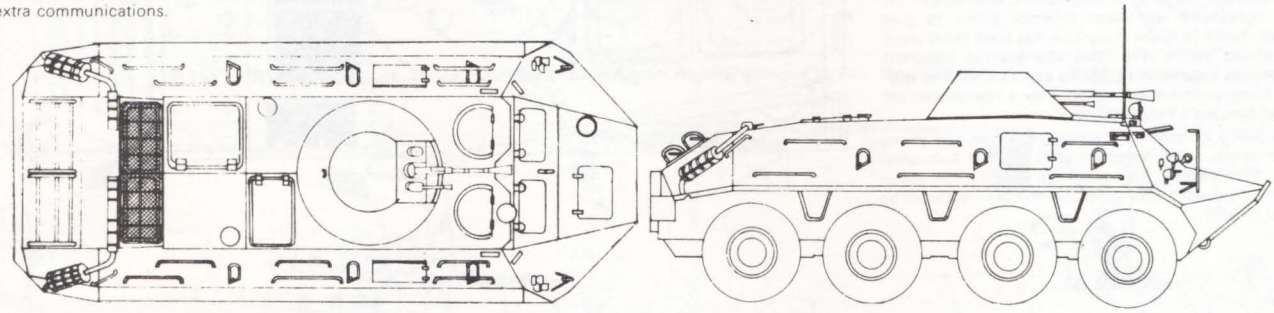
The wartime GAZ-63A 4×4 truck was developed into the BTR-40 scout car which went into production in 1951. Large numbers of many versions are still serving, but from 1959 many were replaced by the amphibious BTR-40P (BRDM), which has central tire-pressure control and two pairs of retractable mid-wheels for rough ground and trench-crossing. Again there are many versions, some carrying either 'Snapper', 'Swatter' or 'Sagger' ATGW (anti-tank guided weapons). All have hydrojet water propulsion. In 1966 appeared BTR-40PB, also called BTR-40P-2 and BRDM-2, which has a modified hull, more power, gun turret (same as on the BTR-60PB) and advanced over-land navigation system. Unlike similar designs of other Warsaw Pact forces it has a single waterjet (not twin). Two important versions respectively mount six AT-3 'Sagger' ATGWs and quad or octuple launchers for the SA-7 surface-to-air missile.

BTR-60

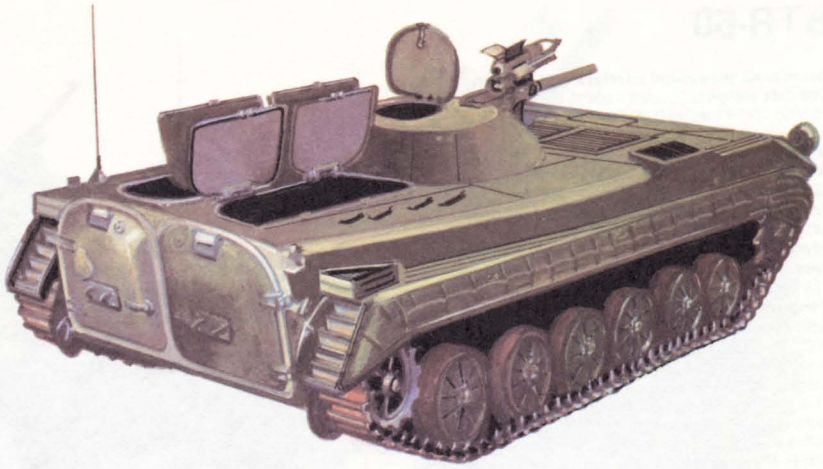
Armoured personnel carriers and derivatives
Combat weight: Loaded: -60PK, 9·82 tons (9980kg); -60PB, 10·14 tons (10,300kg).
Length: 24ft 10in (7560mm).
Width: 9ft 3in (2818mm).
Height: -60PK, 6ft 9in (2055mm); -60PB, 7ft 7in (2310mm).
Engine: Two GAZ-49B six-in-line water-cooled gasoline, 90hp each.
Armament: See text.
Speed: Land, 50mph (80km/h); water, 6¼mph (10km/h).
Range: 310 miles (500km).
Armour: -60PK, 10mm; -60PB, 14mm.

First seen in November 1961, the BTR-60 family is impressive, and is widely used in Warsaw Pact forces (it is the standard APC of the Soviet Marines) and has been exported to at least ten other countries. The large hull is boat-shaped for good swimming and to deflect hostile fire. It runs on eight land wheels, all powered and with power steering on the front four. Tire pressures are centrally controlled at all times. The twin rear engines can be switched to drive waterjets. The basic BTR-60P has an open top or canvas hood, and carries two crew plus 16 troops. Typical armament is a 12·7mm and from one to three 7·62mm SGMB or PK. The -60PK (often called BTR-60PA) has an armoured roof, carries 16 passengers and has a single 12·7 or 7·62mm gun. The PB has a turret with co-axial 14·5mm KPVT and 7·62 PKT (the same turret as on the BTR-40P-2) and carries 14 troops. There are special versions for platoon and other commanders, with extra communications.

Above: **BTR-60PA.** *Below:* **Top and side views of BTR-60PB which has conical turret, mounting 14.5mm and 7.62mm machine guns.** *Photo* **below shows interior of BTR-60 APC**



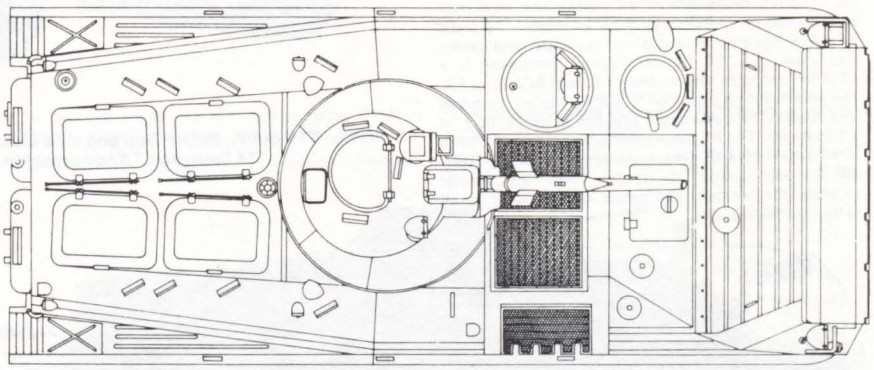
BMP

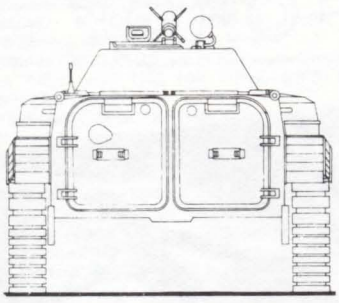


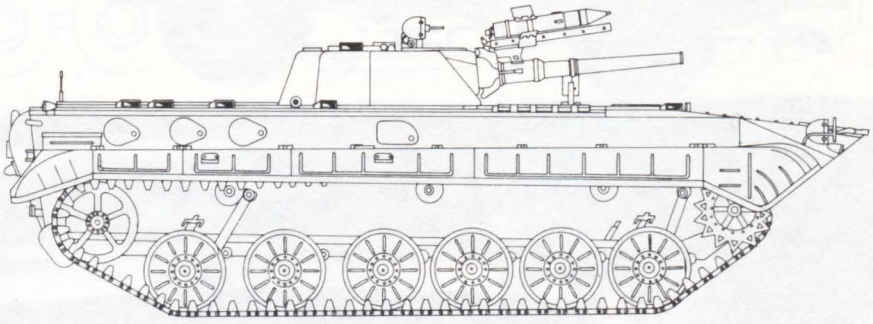
Infantry combat vehicle and derivatives
Weight: Empty, 11·32 tons (11,500kg); laden in combat, 12·3 tons (12,500kg).
Length: 22ft 2in (6750mm) (incorrectly judged at first by Western observers to be 6300mm).
Width: 9ft 9in (2970mm).
Height: Over hull, 4ft 10in (1470mm); over turret IR light, 6ft 6in (1980mm).
Engine: New model of V-6 six-in-line water-cooled diesel; 280hp.
Armament: 73mm (not 76mm) gun, 40 rounds; AT-3 ('Sagger') ATGW launcher; 7·62mm PKT (co-axial), 1,000 rounds.
Speed: Land, 34mph (55km/h); deep snow, 25mph (40km/h); water 5mph (8km/h).
Range: 186 miles (300km).
Armour: Mainly 14mm.

When it appeared in 1967 the BMP was recognised in the West as just what the West's own armies desperately needed: a true MICV (mechanized infantry combat vehicle). Significantly smaller than Western APCs (armoured personnel carriers), it has considerably greater firepower. The eight troops have multiple periscopes and can fire on the move, like the crew of three (the commander is also leader of the troop squad); they have NBC protection in the pressurized and filtered hull. The new 73mm gun has a smooth bore and fires fin-stabilized boosted HEAT ammunition at eight rounds per minute with the aid of an automatic loader. The missile launcher above the gun carries one round, with three more loaded manually from racks inside. The BMP is amphibious, with scoops on the tracks and rear water-deflector plates to give thrust. Since 1970 the sharp bow has been made more prominent, which with other changes has improved swimming behaviour. In 1975 a variant was seen with the troop compartment replaced by a rear-positioned turret carrying a battlefield radar.

The BMP's extreme vulnerability in the face of a strong defence was amply demonstrated in the 1973 Arab-Israeli war. Consequently, there is a fierce debate in the Soviet Army at present (1976) as to how this vehicle should be used in battle.



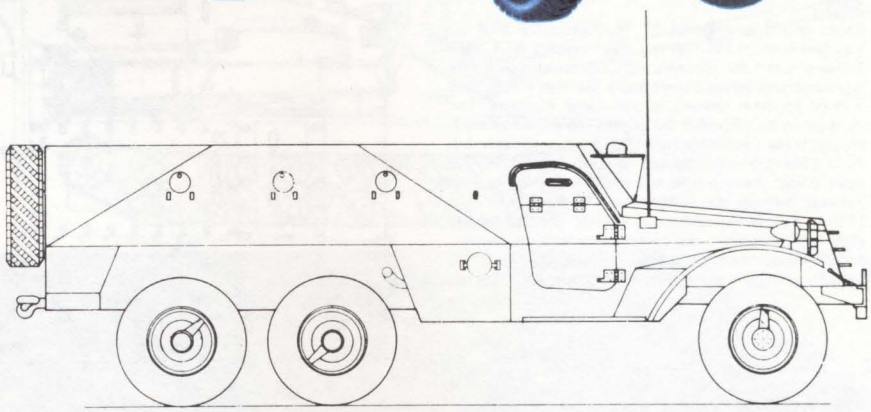




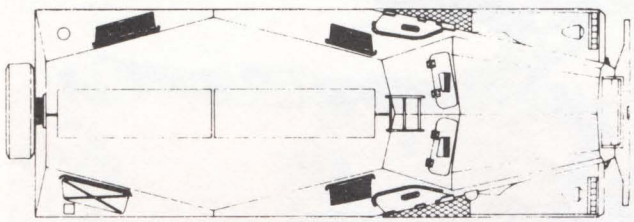
BTR-152

BTR-152 family of APCs and derivatives
Combat weight: Basic 152, loaded: 8·8 tons (8950kg).
Length: 22ft 3in (6830mm).
Width: 7ft 7½in (2320mm).
Height: (Excl. gun) 6ft 6in (1980mm).
Engine: ZIL-123 six-in-line water-cooled gasoline, 110hp.
Armament: usual standard, 7·62mm SGMB, 1,250 rounds. (-152V-2) ZPU-2 twin 14·5mm AA, 300 or 600 rounds.
Speed: 41mph (65km/h).
Range: 405 miles (650km).
Armour: Up to 12mm.

This 6×6 armoured personnel carrier appeared in 1950, and has since been considerably developed. Early versions were based on the ZIL-151 truck, but nearly all in current service use the modified ZIL-157 chassis with larger tires having centralized pressure regulation. These versions are designated -152V, many sub-types differing in equipment and other features. Some have an armoured roof, increasing weight to 9·05 tons (9200kg), while other variations include IR equipment, winch, weapons and the location of tire air piping. The -152U is a command model with extra communications, while the 152V-2 has twin AA guns as noted above. Normal load is a crew of two and 17 troops or almost any light weapons or stores, with additional towed loads. Though being replaced by amphibious vehicles these prolific vehicles still serve at least 30 nations including every Warsaw Pact army except Czechoslovakia.



Top: **BTR-152 with armoured roof.** *Above:* **Standard version with no roof armour.** *Below:* **Top and side views of 152U command version.**



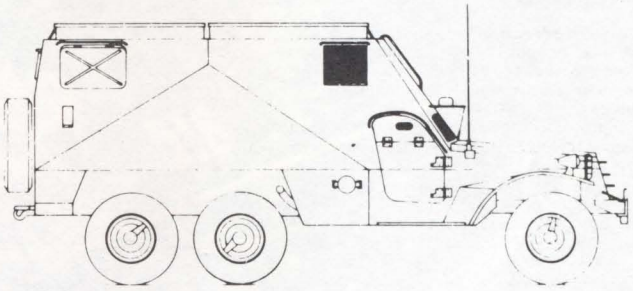
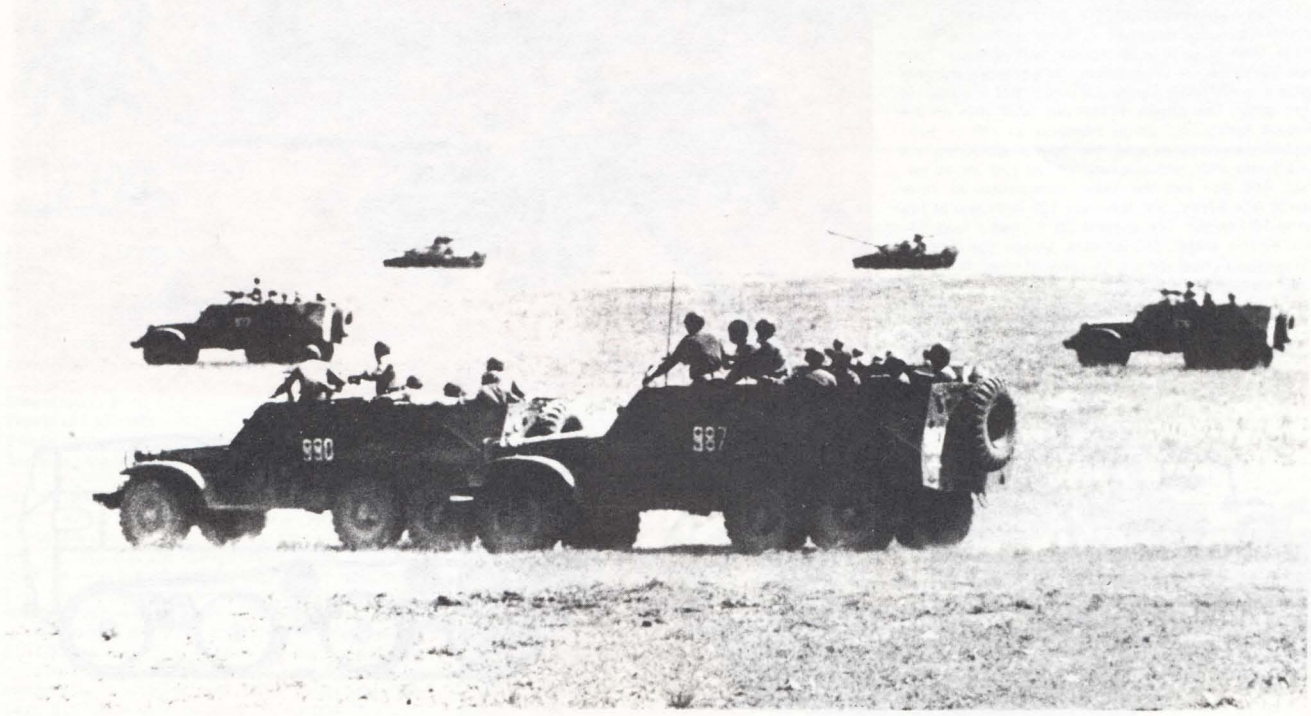


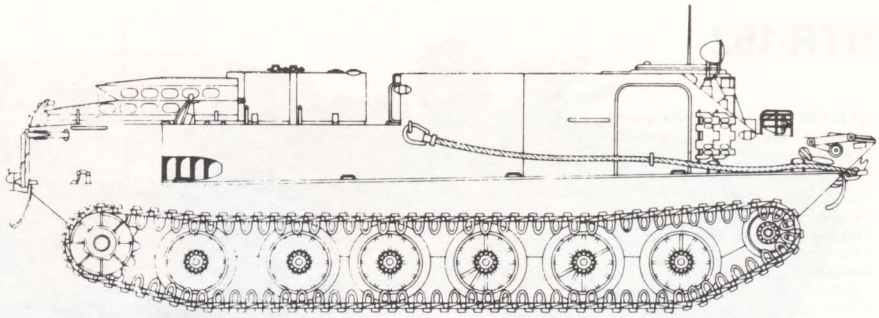
Photo **below shows standard BTR-152 on exercise**

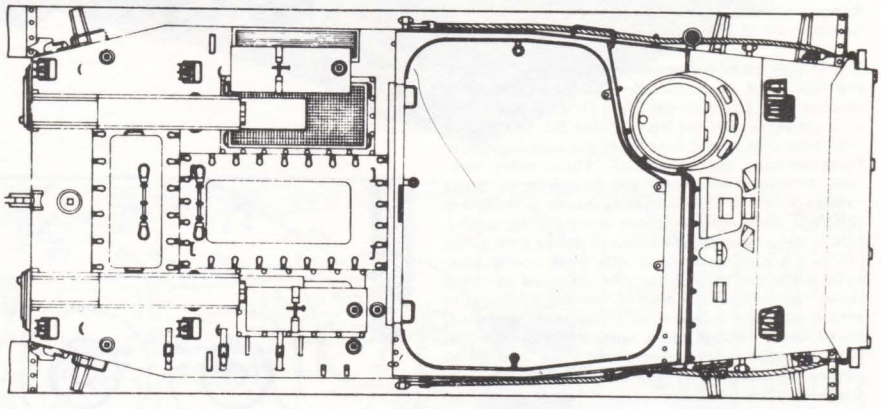


BTR-50

Amphibious tracked APC and variants (data for PK)
Combat weight: (Loaded) 14·27 tons (14,500kg).
Length: 23ft 3in (7080mm) (not 6910mm as commonly reported).
Width: 10ft 3in (3140mm).
Height: (Excl. gun) 6ft 6in (1980mm).
Engine: V-6 six-in-line water-cooled diesel, 240hp.
Armament: 7·62mm SGMB, 1,250 rounds (see text for variations).
Speed: Land, 27mph (44km/h); water 6¼mph (10km/h).
Range: Land 162 miles (260km).
Armour: Up to 10mm.

Based on the amphibious PT-76 chassis, the BTR-50 was first seen in 1957 as the open-topped BTR-50P. Today it is still the standard APC of Soviet motor-rifle regiments and serves Soviet and E German forces, and at least 16 other nations, in very large numbers. The most common version is the 50PK with armoured roof, though these cannot transport the artillery (usually 57, 76 or 85mm) transported and fired aboard the original open model. Normal load is two crew and 20 troops. Variants include the -50PA with 14·5mm KPVT or ZPU-1, the -50PU command vehicle with extremely elaborate navigation and communications equipment, and small numbers of special-purpose modifications used for such tasks as carrying ECM (countermeasures).

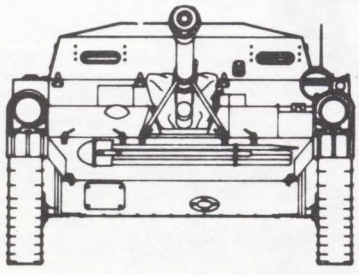


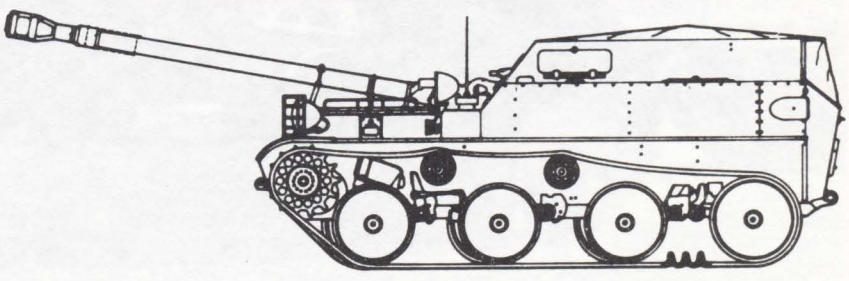


ASU-57

Airborne assault gun
Combat weight: 3·3 tons (3350kg).
Length: (Gun to front) 16ft 4½in (4995mm).
Length: (Excl. gun) 11ft 5in (3480mm).
Width: 6ft 10in (2082mm).
Height: (Shield down, no AA) 3ft 10in (1180mm).
Engine: M-20E four-in-line water-cooled gasoline, 55hp.
Armament: Ch-51M 57mm gun, 30 rounds.
Speed: 28mph (45km/h).
Range: 155 miles (250km).
Armour: 6mm.

The Soviet Union was the pioneer of the modern airborne army which, so far as technology allows, lacks nothing. Great efforts have been made to build up an air-portable capability which includes even self-propelled heavy firepower. The ASU-57 was the first of these purpose-designed vehicles, and since 1957 it has been in large-scale service with Warsaw Pact powers. To get the weight down to a scarcely credible value it is extremely lightly armoured, and is mainly of light alloy. The engine is derived from that of the Pobeda family car. Large transport aircraft or helicopters can carry several, the former delivering via parachutes with retro-rockets ignited just above impact. The gun has the same ammunition as other Soviet ATk 57mm, and traverses 12° with rate of fire up to 10 rds/min. The original Ch-51 had a long 34-slot muzzle brake. Six airborne troops can ride as passengers behind the regular crew of three. It is now being replaced by the BMD.

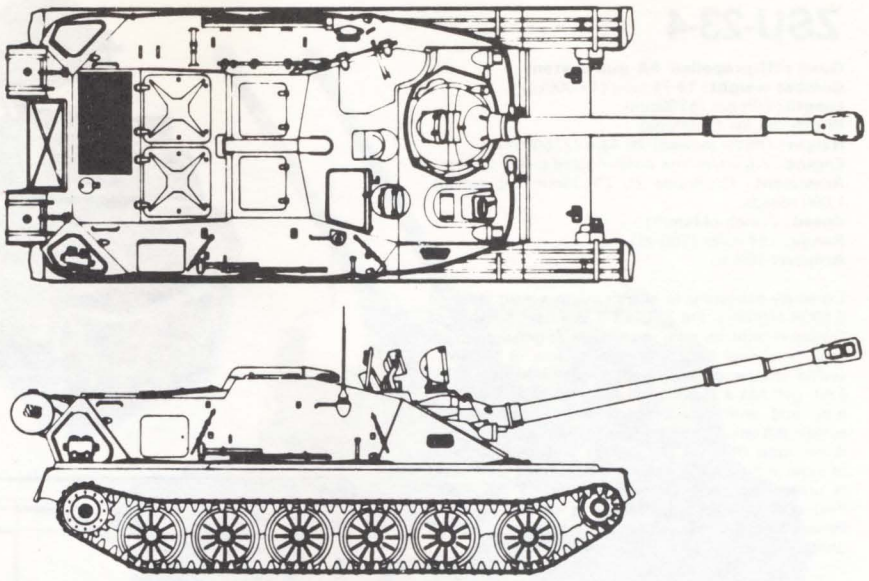


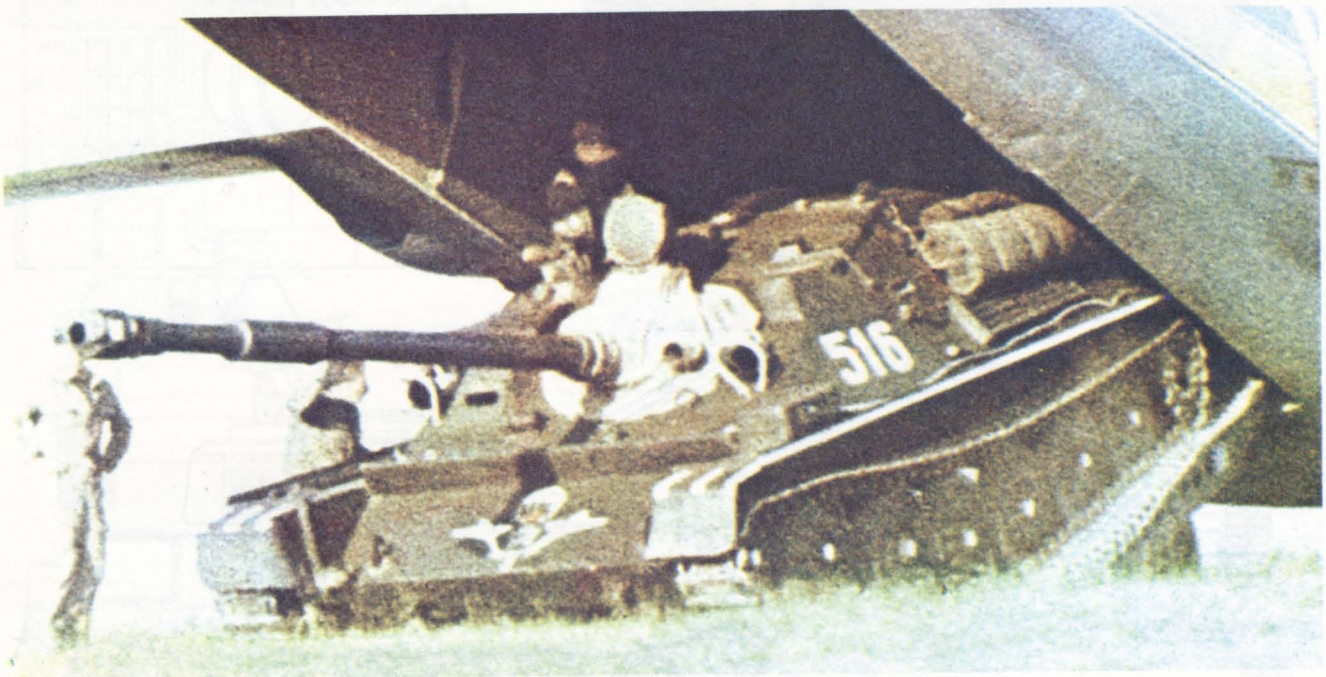


ASU-85

Airborne assault gun
Combat weight: Loaded 13·78 tons (14,000kg).
Length (Gun horizontal ahead) 27ft 10in (8490mm).
Width: 9ft 2½in (2800mm).
Height: (Excl. IR etc.) 6ft 11in (2100mm).
Engine: V-6 six-in-line water-cooled diesel, 240hp.
Armament: Improved SD-44 85mm gun, 40 rounds; 7·62mm PKT (co-axial).
Speed: 27mph (44km/h).
Range: 162 miles (260km).
Armour: Up to 40mm.

Much tougher and heavier than the ASU-57, this formidable vehicle became possible with the advent of the Mi-6 and Mi-10 helicopters and (for fixed-wing drop) high-capacity multi-chute and retro-rocket systems. The ASU-85 was first seen in 1962 and is widely used by Soviet and Polish airborne divisions. Though the chassis is based on the PT-76 it is not amphibious, having no waterjets. The gun has 12° traverse and fires up to 5 rds/min. Above the NBC-sealed and armoured roof are a large IR night-fighting light for the gunner, aligned with the gun, and a smaller one on the right for the commander. Since 1973 other target-acquisition and ranging aids are reported to have been retrofitted to these useful anti-armour vehicles.





SU-100

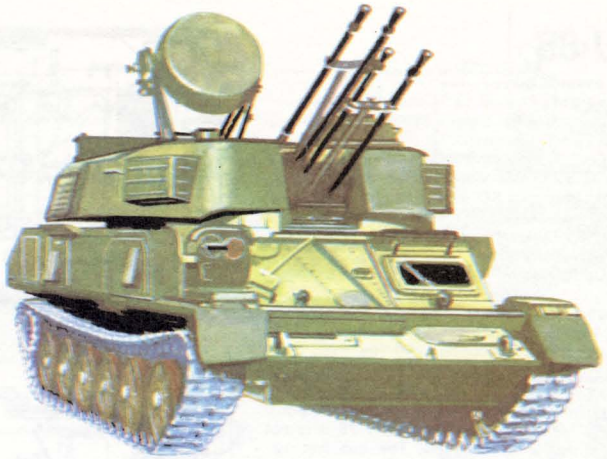
Assault gun.
Weight: (Loaded, no crew) 31·1 tons (31,611kg).
Length: (Incl. gun) 32ft 8in (9960mm).
Length: (Excl. gun) 20ft 3½in (6190mm).
Width: 10ft (3050mm).
Height: (Excl. aerial) 7ft 6in (2300mm).
Engine: V-2-34M vee-12 water-cooled diesel, 500hp (or V-2-3411, 520hp).
Armament: D-10S (M-1944) 100mm gun, 34 rounds.
Elevation: –2° to +17°.
Traverse: 17° total.
Speed: 35mph (55km/h).
Armour: Up to 75mm.

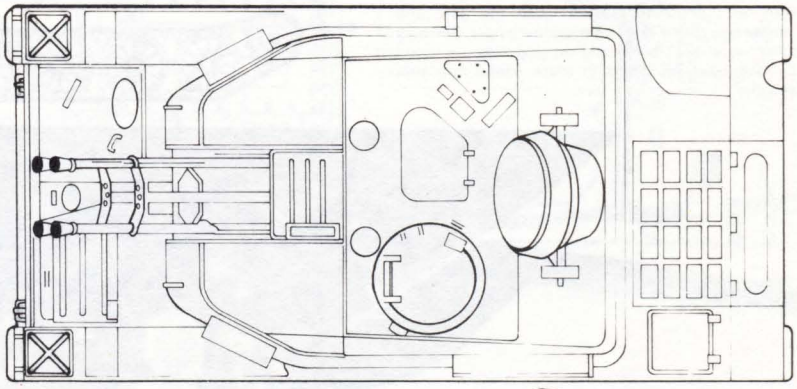
The SU-85 (85mm) assault gun is now seldom seen, most having been converted either into this more formidable vehicle or into training or recovery vehicles. The SU-100 uses the same chassis, based on that of the T-34 tank, but mounts the 100mm gun used in the T-54 and T-55 tanks and uses widely distributed ammunition (the same as for many field and AA guns). A wide range of special-purpose derivatives of the SU-100 are now in use, some having no gun and carrying ECM (countermeasures), dozer blades, command communications and other equipment. The basic SU-100 is used by about 18 nations.

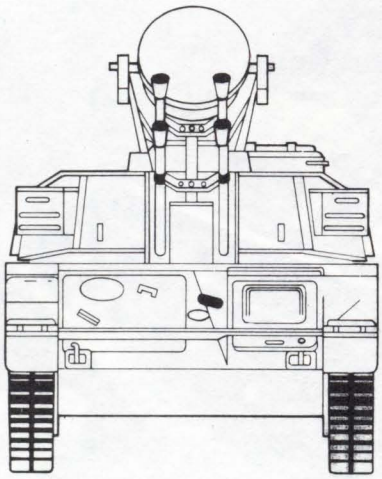
ZSU-23-4

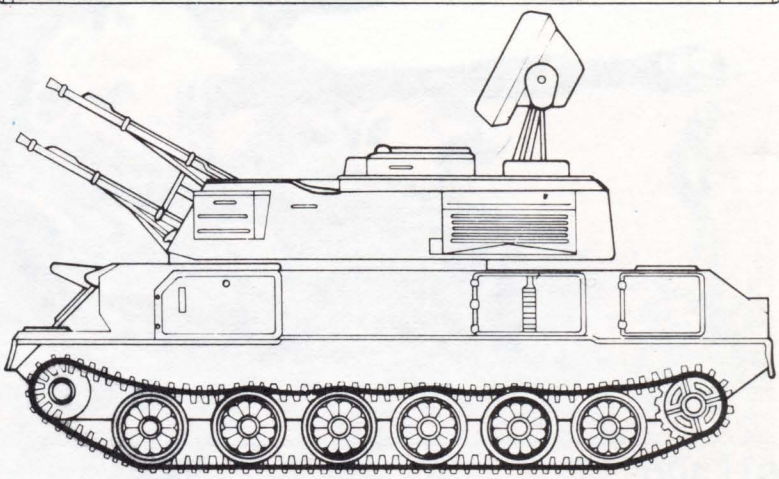
Quad self-propelled AA gun system
Combat weight: 13·78 tons (14,000kg).
Length: 20ft 8in (6300mm).
Width: 9ft 8in (2950mm).
Height: (Radar stowed) 7ft 4½in (2250mm).
Engine: V-6 six-in-line water-cooled diesel, 240hp.
Armament: Quadruple ZU-23 23mm anti-aircraft, 1,000 rounds.
Speed: 27mph (44km/h).
Range: 162 miles (260km).
Armour: 10mm.

Extremely dangerous to aircraft out to a slant range of 6,600ft (2000m), the ZSU-23-4 is a neat package of firepower with its own microwave target-acquisition and fire-control radar and crew of four in an NBC-sealed chassis derived from the amphibious PT-76. Each gun has a cyclic firing rate of 800 to 1,000rds/min, and with liquid-cooled barrels can actually sustain this rate. The crew of four comprise commander, driver, radar observer and gunner, and there is plenty of room in the large but thin-skinned turret. Gun travel is unrestricted in traverse, and from −7° to +80°. First seen in 1955, this vehicle is used throughout Warsaw Pact armies where it is popularly named Shilka. The same chassis carries the SA-6 missile.





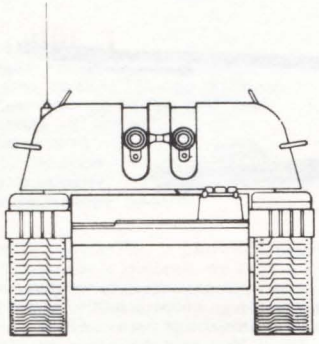


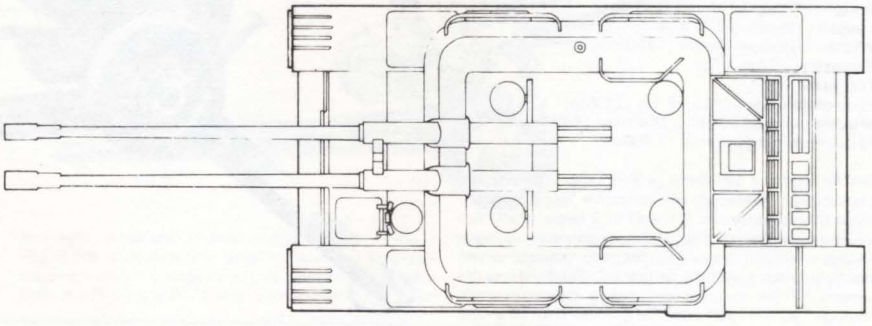


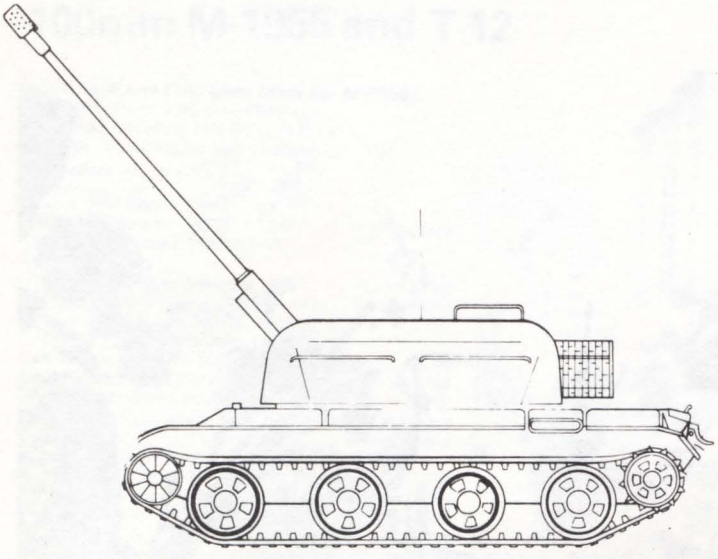
ZSU-57-2

Twin self-propelled AA guns.
Combat weight: 27·65 tons (28,100kg).
Length: (Guns forward) 27ft 10in (8480mm).
Length: (Guns up or to rear) 20ft 6in (6220mm).
Width: 10ft 9in (3270mm).
Height: (Guns down) 9ft 0in (2750mm).
Engine: V-54 vee-12 water-cooled diesel, 520hp.
Armament: Twin S-68 57mm AA guns, 316 or 360 rounds.
Speed: 30mph (48km/h).
Range: 250 miles (400km).
Armour: Up to 15mm.

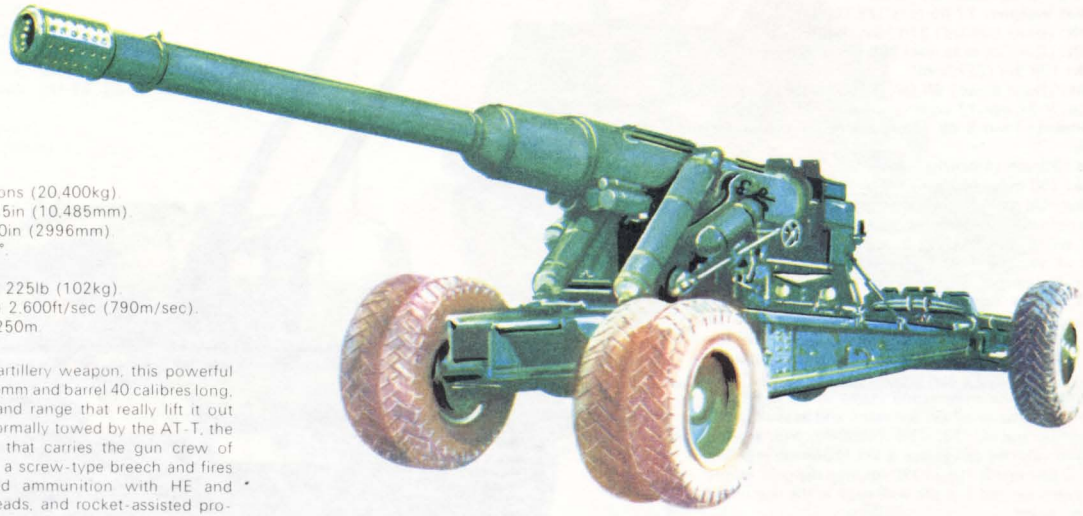
Used in greater numbers than any other SP AA system in the world, the ZSU-57-2 appeared in 1957 and equips all Warsaw Pact forces and at least 11 other nations. The chassis is a shortened version of that used in the T-54 tank, and notable shortcomings are absence of swimming or deep-wading capability, or a radar. IR and a conventional optical system are fitted, and the crew of six have a considerable amount of equipment. Turret slewing (360°) and elevation (−5° to +85°) are hydraulic, and the ammunition (same as the S-60 gun but not the same as 57mm anti-tank and assault guns) is effective out to 13,125ft (4000m) and against armoured vehicles can pierce 4·2in (106mm) at 500m range. Cyclic rate is 105 to 120 rds/min per gun, empty cases being ejected into the wire cage at the rear of the big open turret.







M-1955



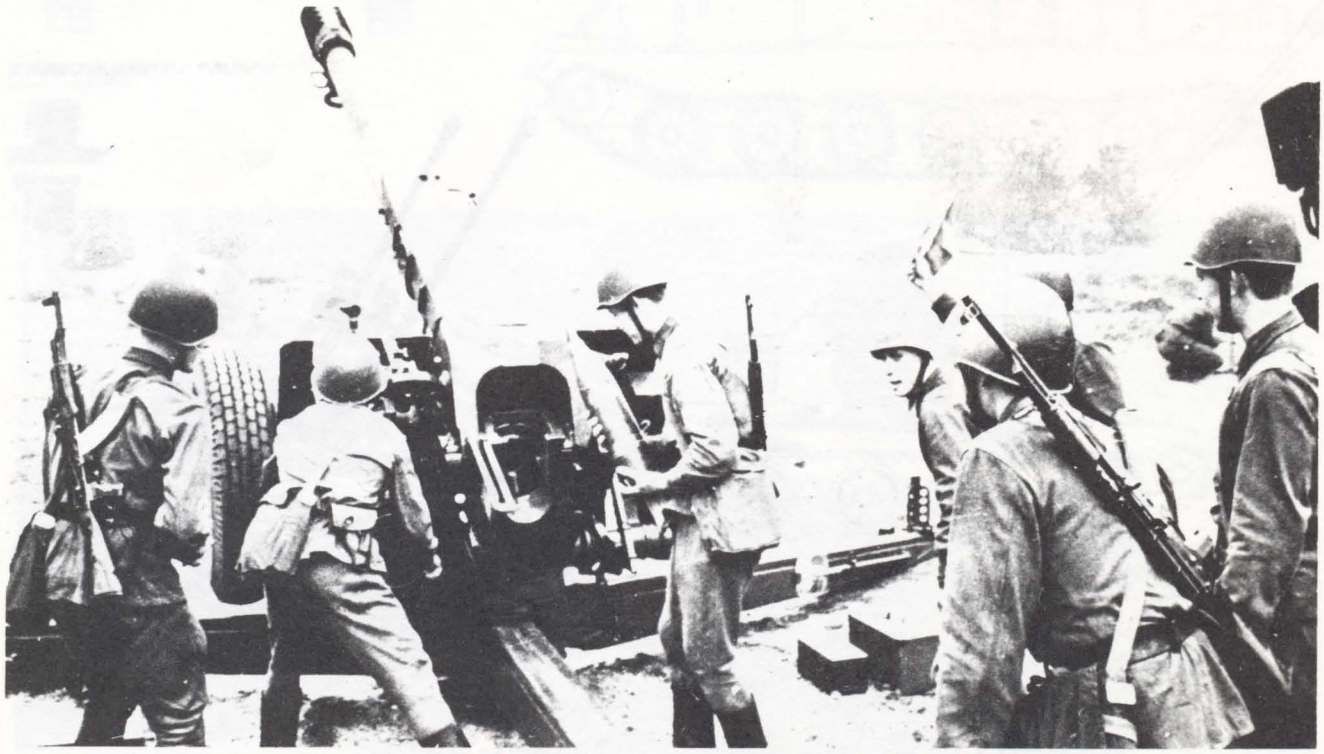
Field howitzer.
Weight: Firing 20·07 tons (20,400kg).
Length: Travelling 34ft 5in (10,485mm).
Width: Travelling 9ft 10in (2996mm).
Elevation: −2° to +50°.
Traverse: ±22°.
Projectile mass: (HE) 225lb (102kg).
Muzzle velocity: (HE) 2,600ft/sec (790m/sec).
Maximum range: 29,250m.

Largest modern Soviet artillery weapon, this powerful piece has a calibre of 180mm and barrel 40 calibres long, giving muzzle velocity and range that really lift it out of the howitzer class. Normally towed by the AT-T, the 415hp tracked monster that carries the gun crew of 14–16, the M-1955 has a screw-type breech and fires separate-loading bagged ammunition with HE and concrete-piercing warheads, and rocket-assisted projectiles with very long range. Typical rate of fire is one round per minute. When travelling, the barrel is pulled back out of battery over the box-section split trails.

122mm D-30

Field howitzer.
Weight: Firing 3·1 tons (3150kg).
Length: Travelling 17ft 8½in (5400mm).
Width: Travelling 6ft 5in (1950mm).
Elevation −7° to +70°.
Traverse: 360°.
Projectile mass: (HE) 48·1lb (21·8kg).
Muzzle velocity: (HE) 2,264ft/sec (690m/sec).
Maximum range: (HE) 15,300m.

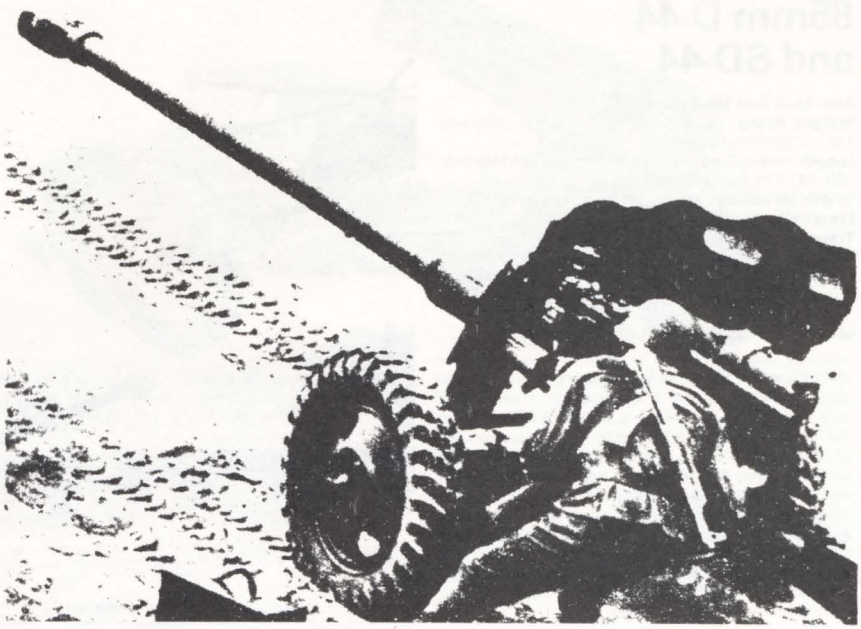
This howitzer, of 121·9mm (4·8in) calibre, typifies the dramatically advanced and effective design of the latest Soviet artillery. It is towed by a large lunette lug under or just behind the muzzle brake, with its trails folded under the barrel. To fire, the crew of seven rapidly unhitch, lower the central firing jack (lifting the wheels off the ground) and swing the outer trails through 120° on each side. The gun can then be aimed immediately to any point of the compass. The barrel is carried under a prominent recoil system, has a semi-auto vertically sliding wedge breechblock, and fires cased but variable-charge, separate-loading ammunition. The D-30 is used throughout the Warsaw Pact and is exported to at least five other countries.



122mm D-74

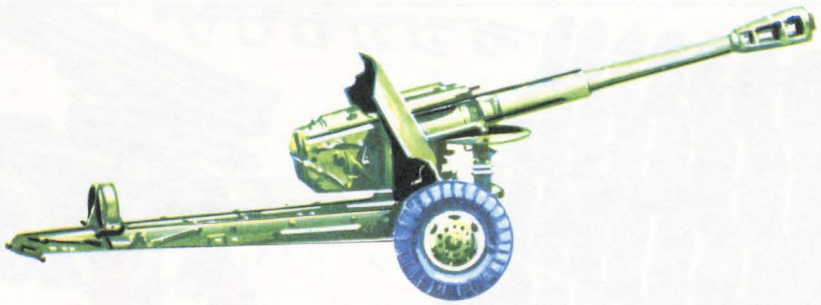
Field gun.
Weight: Firing 6·49 tons (6600kg).
Length: Travelling 32ft 0in (9763mm).
Width: Travelling 6ft 7½in (2027mm).
Elevation: −2° to +50°.
Traverse: ±30°.
Projectile mass: (APHE) 55·1lb (25kg).
Muzzle velocity: (APHE) 3,116ft/sec (950m/sec).
Maximum range: (HE) 21,900m.

Complementing the appreciably bigger and longer-ranged M-1954 and M-1946, which have a calibre of 130mm, the D-74 has a calibre of 121·9mm (4·8in) and uses the same chassis as the 152mm D-20 howitzer. It is similar to the D-20 in firing cased but separately loaded, variable-charge ammunition, and in having a circular firing jack and caster wheels for swiftly rotating the whole gun through 360°. Despite its smaller calibre the barrel (and thus the whole gun) is heavier than that of the D-20, because the length in calibres is 46·3, compared with only 29. Like the 152mm version the barrel is prominently stepped and has a semi-automatic vertically sliding wedge breechblock, and a double-baffle muzzle brake. The D-74 serves throughout the Warsaw Pact ground forces.



152mm D-20

Field howitzer.
Weight: Firing 5·56 tons (5650kg).
Length: Travelling 26ft 8½in (8138mm).
Width: Travelling 6ft 7½in (2027mm).
Elevation −5° to +63°.
Traverse: ±45°.
Projectile mass: (HE) 96·0lb (43·6kg).
Muzzle velocity: (HE) 2,149ft/sec (655m/sec).
Maximum range: 17,300m.



Standard heavy artillery in partnership with the D-74 (whose carriage is identical), the D-20 is a powerful 6-inch weapon which replaced the M-1937 (ML-20) of the same calibre used during World War 2. The massive barrel has a large double-baffle muzzle brake and semi-automatic sliding-wedge breech giving a rate of fire up to 4rds/min despite the use of separate-loading, variable-charge case-type ammunition. Essentially the D-20 is a D-74 with shorter barrel, the recoil mechanism being the same, as is the ability to traverse the whole gun swiftly through up to 360°. The D-20 is widely used throughout Warsaw Pact forces and also by several other nations.

100mm M-1955 and T-12

Anti-tank and field guns (data for M-1955).
Weight: Firing 2·95 tons (3000kg).
Length: Travelling 28ft 7in (8717mm).
Width: Travelling 5ft 2½in (1585mm).
Elevation: −5° to +45°.
Traverse: ±30°.
Projectile mass (APHE) 35lb (15·9kg).
Muzzle velocity: (APHE) 3,280ft/sec (1000m/sec).
Maximum range: (HE) 21,000m.

One of the most widely used guns of the Warsaw Pact ground forces, these long-barreled (56 calibres) weapons have high muzzle velocity and can fire HE, APHE or HEAT ammunition. Fixed ammunition is used, which with the semi-automatic, vertical-sliding wedge breechblock gives a practical rate of fire of 7 to 8rds/min. The M-1955 is lighter than the old M-1944 (D-10) and so runs on single tires. It has box-section split trails, twin recoil cylinders behind the shield, and a prominent 'pepperpot' muzzle brake. The later T-12, which has replaced the M-1955 in many Soviet and E. German units since 1968, has a new barrel firing different ammunition with greater muzzle velocity. The most obvious difference is that the muzzle brake does not taper and is only fractionally larger in diameter than the barrel. Usual towing vehicle is the ZIL-131, ZIL-157 or AT-P tracked tug, all of which carry the crew of seven and other personnel.

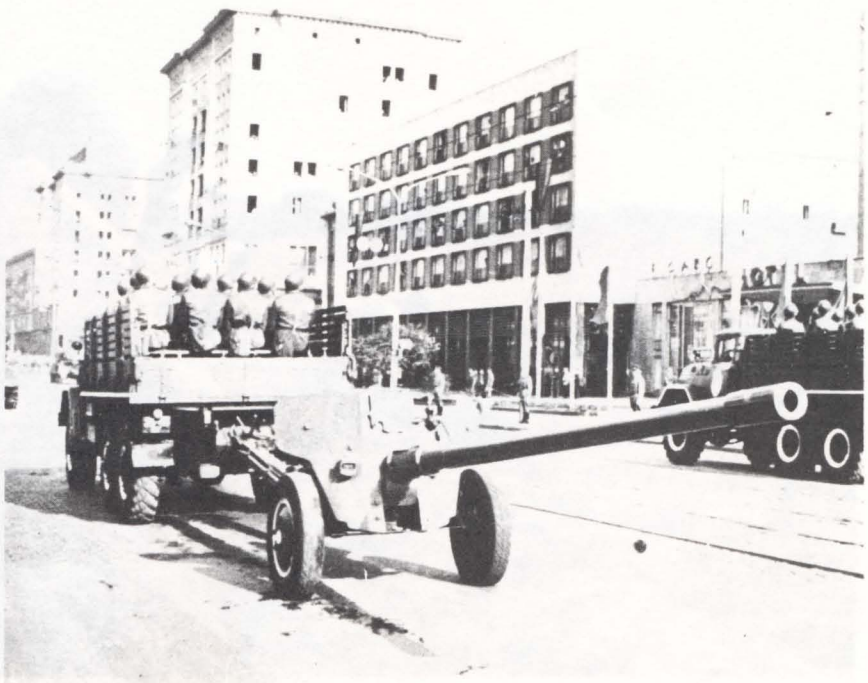


Photo: **T-12 towed by ZIL-157**

85mm D-44 and SD-44

Anti-tank and field guns.
Weight firing: (D-44) 3,804lb (1725kg); (SD-44) 4,961lb (2250kg).
Length travelling: (D-44) 27ft 4in (8340mm); (SD-44) 27ft 0in (8220mm).
Width travelling: (Both) 5ft 10in (1780mm).
Elevation: (Both) −7° to +35°.
Traverse: ±27°.
Projectile mass: (HE) 21·0lb (9·5kg); (HVAP) 11·0lb (5kg).
Muzzle velocity: (HE) 2,598ft/sec (792m/sec); (HVAP) 3,379ft/sec (1030m/sec).
Maximum range: (HE) 15,650m.

Variously designated D-44, D-48 or M-1945, the 85mm divisional gun is one of the most widely used in the Soviet ground forces. The gun is the same as in the T-34-85 tank and M-1944 AA weapons, and is also used in the SU-85 and ASU-85 assault vehicles. It fires various kinds of fixed ammunition at 15 to 20 rds/min, with the usual semi-automatic vertical-sliding wedge-type breech. The muzzle brake is a double baffle. To enable this gun to drive itself about the battlefield it can be fitted with an auxiliary engine, becoming the SD-44. The M-72 two-cylinder 14 hp engine is mounted on the hollow left trail, in which is its fuel; the right trail carries ready ammunition. The SD-44 is completed by the driver's seat and steering on a large trail wheel.

Photo: **SD-44 after landing by Mi-6 helicopter.**

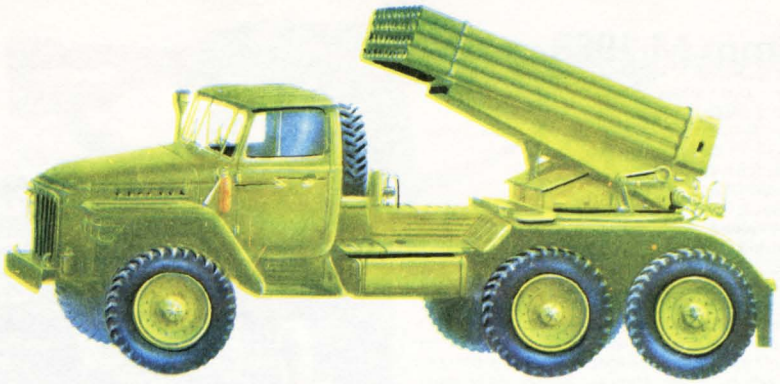
RPG-7V

Anti-tank launcher.
Weight firing: (Excluding projectile) 14·4lb (6·5kg).
Length: (Without projectile) 37½in (953mm).
Calibre of tube: 40mm.
Calibre of projectile: 84·5mm.
Mass of projectile: 5½lb (2·5kg).
Muzzle velocity: 328ft/sec (100m/sec).
Burn-out velocity: 984ft/sec (300m/sec).
Effective range: (Moving target) 300m.

Standard anti-armour weapon of Soviet infantry, the RPG-7V replaced an earlier weapon derived from the World War 2 German Panzerfaust which merely fired the hollow-charge projectile from a shoulder-rested tube. RPG-7V fires a new projectile which, a few metres beyond the muzzle, ignites an internal rocket to give shorter flight-time, flatter trajectory and better accuracy. The HEAT or HE warhead has improved fuzing, the HEAT round penetrating to 320mm (12·6in) of armour. The optical sight is frequently supplemented by the NSP-2 (IR) night sight.

122mm BM-21

Rocket launcher (40 rounds).
Weight: One rocket, 101lb (45·9kg); launcher, 7,718lb (3500kg); vehicle, launcher and 40 rounds, 11·3 tons (11,500kg).
Length: Rocket 8·99ft (2740mm); vehicle, 24ft 1in (7350mm).
Calibre: 4·8in (122mm).
Engine: (Vehicle) ZIL-375 vee-8 gasoline, 175hp.
Speed: (Vehicle) 47mph (75km/h).
Launcher: Elevation 0° to +50°.
Traverse: ±120°.
Time to reload: 10min.
Maximum range: (Rocket) over 15,000m.



An important multi-rocket system which first appeared in November 1964, the BM-21 uses a smaller-calibre rocket than any other of its era, and can thus fire a greater quantity (40). It is the first rocket system carried by the outstanding Ural-375 truck, which among other attributes has exceptional cross-country capability. The rockets are fired in salvo, or 'rippled' in sequence or selected individually, always with the vehicle parked obliquely to the target to avoid blast damage to the unprotected cab. The BM-21 is used by the Soviet ground forces and by those of several other Warsaw Pact nations except Czechoslovakia (which uses its rather similar M-51).

140mm M-1965

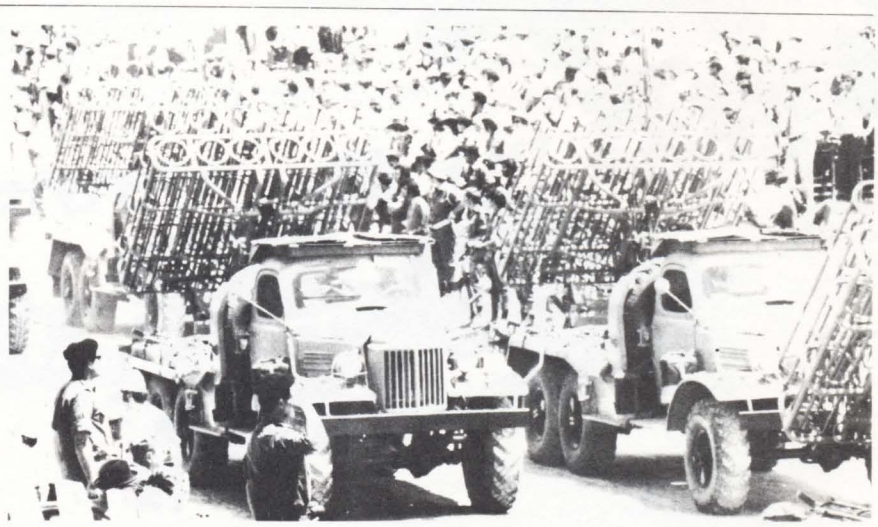
Rocket launcher.
Weight: One rocket, 87·3lb (39·6kg); launcher (loaded) 2,646lb (1200kg).
Length: Rocket, 43in (1092mm); launcher (tubes horizontal) 13·2ft (4·0m).
Calibre: 5·5in (140mm).
Elevation: 0° to +45°.
Traverse: ±15°.
Time to reload: 4min.
Maximum range: 10,600m.

The 140mm is one of the most-used artillery rockets in the Soviet forces. Many units fire it in a battery of 16 from the BM-14-16 launcher carried by the ZIL-151 or -157 6×6 trucks, or in a battery of 17 from the BM-14-17 mounted on the light GAZ-63 (the BM-14-17 is used by Soviet Marines, among many other forces). Soviet airborne troops use the light towed M-1965 launcher, first seen in 1967. This has 16 barrels, carried on the same chassis as the M-1943 57mm anti-tank gun. This is also used by some other Warsaw Pact forces, though the Polish army has its own 8-barrel WP-8 firing the same spin-stabilized missiles.

240mm BM-24

Rocket launcher (12 rounds).
Weight: one rocket, 248lb (112·5kg); launcher, 5,995lb (2720kg); loaded launcher on ZIL-157, 9·35 tons (9500kg); loaded launcher on AT-S tractor, 15 tons (15,240kg).
Length: Rocket, 46½in (1180mm); ZIL truck, 22ft 4in (6800mm); AT-S tractor, 19ft 2½in (5870mm).
Calibre: 9·5in (240mm).
Elevation: 0° to +45°.
Traverse: ±105°.
Time to reload: 3–4min.
Maximum range: 11,000m.

The Soviet 240mm rocket is a spin-stabilized weapon of relatively short and fat shape, packing a tremendous punch but having short range for its calibre. One of its standard carriers is the ZIL-157 truck, on which is mounted an open-frame launcher of welded steel tube, with two rows of six rounds. Another is the AT-S tracked vehicle, found chiefly in armoured units, on which is mounted a different 12-round launcher of the tube type. The truck-mounted frame launcher is used by many countries, but the AT-S installation is believed to be used only by the Soviet Union.



240mm M-240 (M-1953)

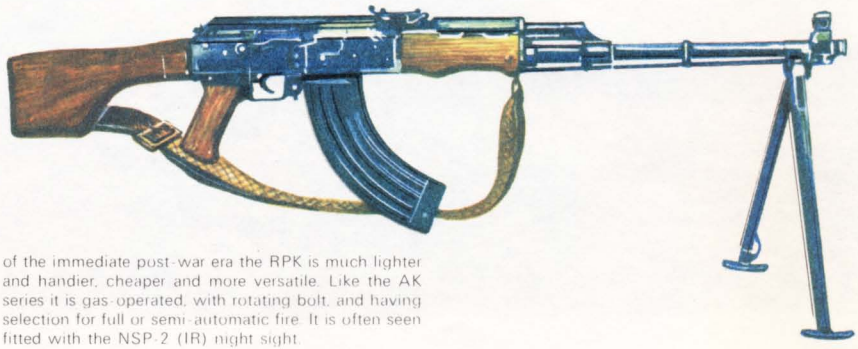
Heavy mortar.
Weight firing: 7,960lb (3610kg).
Length travelling: 21ft 4in (6510mm).
Height travelling: (To top of rim of 2130mm circular baseplate) 7ft 3in (2210mm).
Length of tube: 17ft 6in (5340mm).
Mass of projectile: (HE) 221lb (100kg).
Muzzle velocity: 1,180ft/sec (362m/sec).
Elevation: +45° to +65°.
Traverse: 17° total.
Maximum range: 9700m.

By far the largest mortar in service with any army, this awesome weapon is used by the Soviet Union, certain other Warsaw Pact forces and about four other countries. It is towed muzzle first by an AT-P or other tracked tug in which rides the crew of eight and ammunition. The latter is loaded breech-first, with the tube rotated on a trunnion frame to the horizontal position and the bombs offered up by a trolley or two-man bar-sling. The tube is then returned to its preset aimed position and the round fired by a lanyard. It has been reported that 240mm mortar ammunition includes nuclear rounds, but this is unconfirmed.

7.62mm RPK

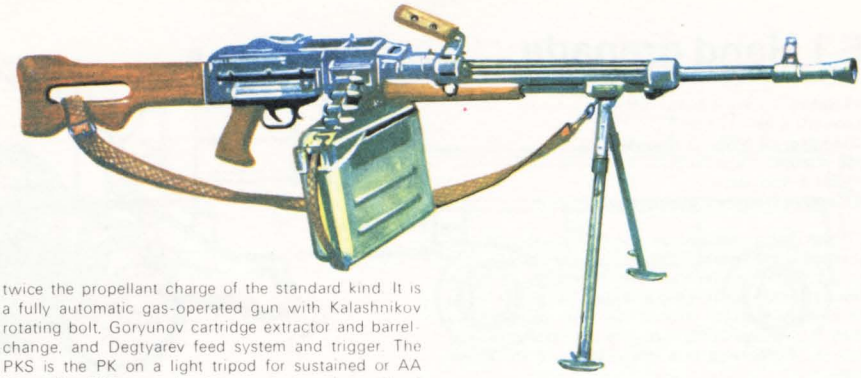
Light machine gun.
Weight: With box magazine (loaded) 12·4lb (5·6kg), (unloaded) 11·1lb (5·0kg); with drum magazine (loaded) 15·0lb (6·8kg), (unloaded) 12·4lb (5·6kg).
Length overall: 41in (1040mm).
Ammunition: Standard M43 (M-1943).
Muzzle velocity: 2,411ft/sec (735m/sec).
Effective range: 800m.
Rate of fire: (Cyclic) 600rds/min.

Standard Soviet LMG, the Kalashnikov RPK is essentially an AK-47 assault rifle with a longer and heavier barrel, bipod, different stock and two larger-capacity magazines, a 40-round curved box and 75-round drum. At any time regular AK or AKM magazines can be clipped on instead. Compared with the Degtyarev RPD of the immediate post-war era the RPK is much lighter and handier, cheaper and more versatile. Like the AK series it is gas-operated, with rotating bolt, and having selection for full or semi-automatic fire. It is often seen fitted with the NSP-2 (IR) night sight.



7.62mm PK

General-purpose machine gun.
Weight of basic gun: (Bipod) 19·8lb (9·0kg); (tripod) 36·3lb (16·5kg).
Weight of ammunition box: With 100-round belt, 8·58lb (3·9kg); 200-rd belt, 17·6lb (8·0kg); 250-rd belt, 20·6lb (9·4kg).
Length: (Gun) 45·7in (1173mm); (on tripod) 49·5in (1270mm).
Ammunition: Soviet 7·62 rimmed Type 54R, propellant charge 3·11g.
Muzzle velocity: 2,755ft/sec (840m/sec).
Effective range: 1000m.
Rate of fire: (Cyclic) 650 rds/min.



Though a hotch-potch of other weapons (mostly the Kalashnikov AK-47), the PK family is an excellent series of weapons which can be described as the first Soviet GPMGs (general-purpose MGs). Unlike almost all other Soviet rifle-calibre weapons except the sniper's rifle it fires the long rimmed cartridge with over twice the propellant charge of the standard kind. It is a fully automatic gas-operated gun with Kalashnikov rotating bolt, Goryunov cartridge extractor and barrel-change, and Degtyarev feed system and trigger. The PKS is the PK on a light tripod for sustained or AA firing. The PKT is a solenoid-operated version without sights, stock or trigger mechanism for use in armoured vehicles. The PKM is the latest service version with unfluted barrel and hinged butt rest, weighing only 8·39kg (18½lb); in a tripod it becomes the PKMS. The PKB has stock and trigger replaced by a butterfly trigger for pintle mounting on armoured vehicles (but the standard PK and PKM can be fired from the ports of, say, a BMP).

12.7mm DShK

Heavy machine gun.
Weight: (Basic gun) 75lb (34kg).
Length overall: 62½in (1588mm).
Ammunition: All standard Soviet 12·7mm, in 50-round metal-link belt (in most installations fed from box).
Muzzle velocity: (API) 2,822ft/sec (860m/sec).
Effective range: (Horizontal) 1500m; (slant) 1000m.
Rate of fire: (Cyclic) 550–600rds/min.

This old gas-operated weapon is still used in great numbers in many applications. The basic Degtyarev Shpagin model is the M 1938/46, of post war vintage, but the basic design is earlier. Most DShK guns in land forces are carried on a two-wheel chassis, which increases total weight to 368lb (167kg), whose trail legs can be extended to form a tall tripod for AA use. Other examples are found on many Soviet armoured vehicles, including several types of tank and APC, primarily as an AA weapon with day and night optical sighting.

7.62mm AK and AKM

Assault rifles.
Weight: AK (loaded magazine) 10·58lb (4·8kg); (empty magazine) 9·47lb (4·3kg); AKM (loaded magazine) 8·0lb (3·64kg) (early version 8·4lb, 3·8kg); (empty magazine) 6·93lb (3·14kg) (early version 7·3lb, 3·31kg).
Length overall (no bayonet): AK-47 (either butt), 34·25in (870mm); AKM, 34·5in (876mm).
Ammunition: Standard M43 (M-1943).
Muzzle velocity: 2,345ft/sec (715m/sec).
Effective range: (semi-auto) 400m; (auto) 300m.
Rate of fire: Cyclic, 600rds/min; auto, 90rds/min; semi-auto, 40rds/min.

Produced in greater quantity than any other modern small arms, the Kalashnikov AK and AKM can fairly be claimed to have set a new standard in infantry weapons. The original AK-47 came with a wooden stock or (for AFV crews, paratroopers and motorcyclists) a folding metal stock. It owed much to German assault rifles, and like them uses a short cartridge firing a stubby bullet. A gas-operated weapon with rotating bolt (often chrome-plated), it can readily be used by troops all over the world of any standard of education, and gives extremely reliable results under the most adverse conditions. Versions with different designations have been licence-produced in at least five countries, and it is used in about 35. The standard Soviet military weapon today is the AKM, an amazingly light development making extensive use of plastics and stampings, and with a cyclic-rate reducer, compensator and other improvements. Either rifle can have luminous sights or the NSP-2 IR sight. Another fitment is a new bayonet which doubles as a saw and as an insulated wire-cutter.

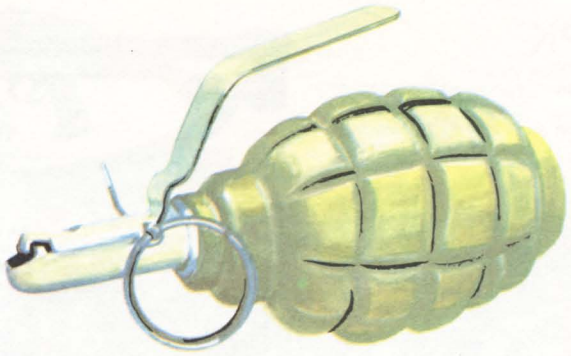
7.62 SVD

sniper rifle
Weight (with PSO-1 sight): (Loaded magazine) 9·95lb (4·52kg); (empty magazine) 9·4lb (4·3kg).
Length (no bayonet): 48¼in (1225mm).
Ammunition: Long 7·62mm rimmed, Type 54R, 3·11g propellant charge.
Muzzle velocity: 2,725ft/sec (830m/sec).
Effective combat range: 800m.
Rate of fire, semi-auto: 20rds/min.

The Dragunov SVD sniper's rifle is a thoroughly modern, purpose-designed weapon, though it uses the same 54R ammunition as the old 1891/30 sniper's rifle and the RK series of GPMGs. It is reported that users are issued with selected batches of ammunition to increase accuracy. A gas-operated semi-automatic rifle, the SVD has the Kalashnikov rotating-bolt breech but a completely new trigger system, barrel and 10-round magazine. The muzzle has a flash suppressor and a recoil compensator to hold the barrel near the target. The PSO-1 sight is 370mm (14½in) long, and comprises a ×4 optical telescope with rubber eyepiece, integral rangefinder, battery-powered reticle illuminator, and IR sighting for use at night.

F-1 Hand grenade

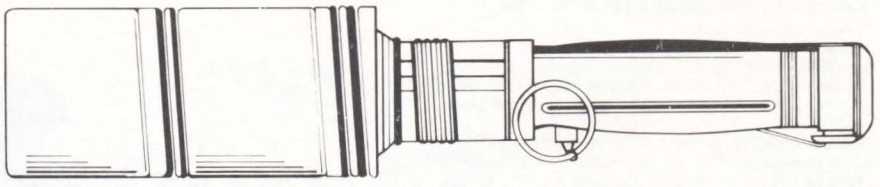
Weight: (Fuzed) 1·54lb (700g).
Length: 4·9in (124mm).
Diameter of body: 2·16in (55mm).
HE charge: 1·6oz (45g).
Fuze: 3–4sec delay.
Effective fragmentation radius: 14·7m.



Though being replaced by the RGD-5, this familiar grenade is still widely distributed among Warsaw Pact forces. Similar to the traditional British No 36 (Mills bomb) and US Mk II, it has a modest charge contained in a heavy body of serrated cast iron, painted olive drab. It uses the UZRG fuze, and the same body and fuze is incorporated in a rifle grenade of the Polish army.

RKG-3M Anti-tank hand grenade

Weight: (Fuzed) 2·34lb (1070g).
Length: (Before firing) 14¼in (362mm).
Diameter of head: 2·19in (55·6mm).
HE charge: 1¼lb (567g).
Fuze: Impact.
Typical range: Up to 20m.
Armour penetration: 125mm.



Standard hand-thrown anti-armour grenade of the Warsaw Pact forces, the RKG-3M is a stick-type HEAT (high-explosive anti-tank) weapon with a substantial HE charge behind a copper conical lining. This shaped charge can pierce about 5 inches of armour. To ensure that it hits nose-first, a stabilizing drogue parachute deploys as soon as the stick leaves the thrower's hand.

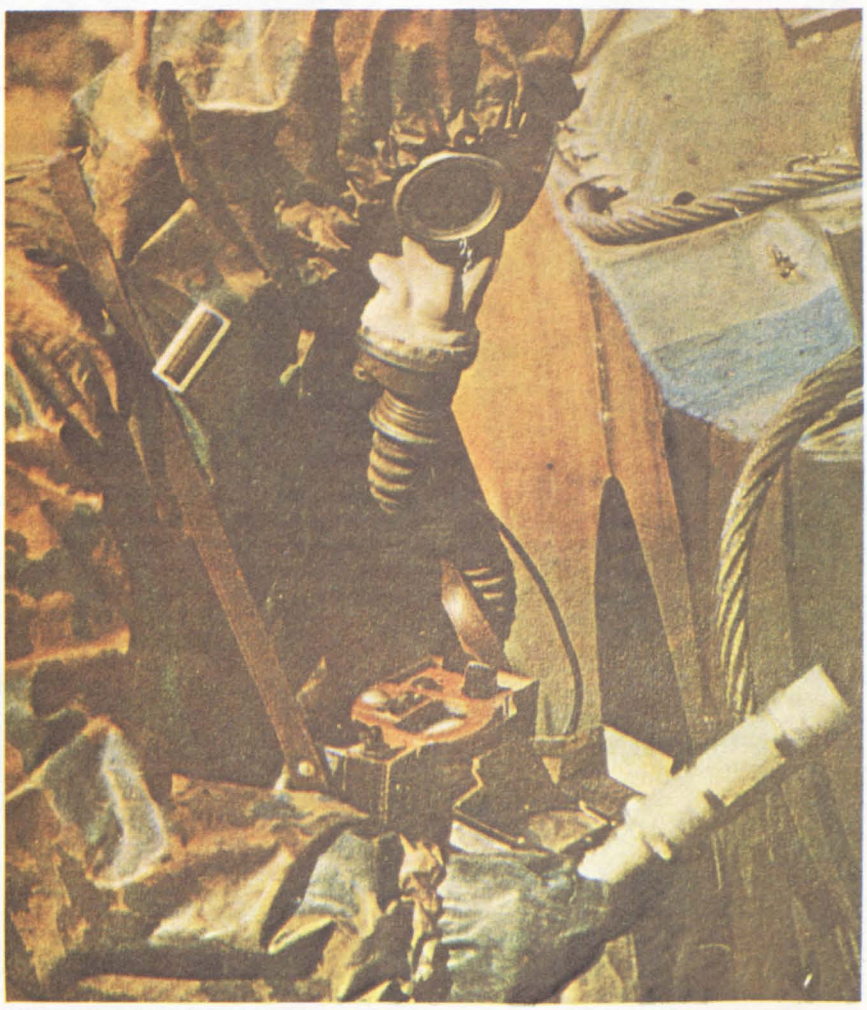
Nuclear, biological and chemical warfare

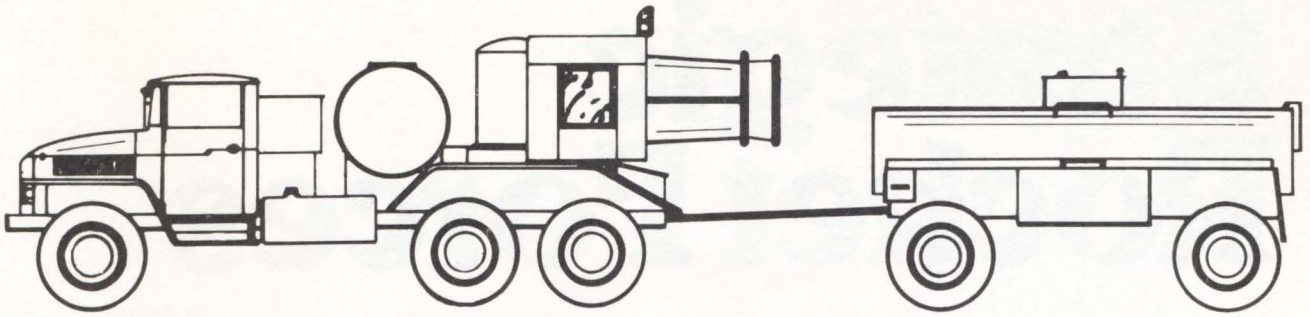
NBC warfare, sometimes alternatively called CBR (chemical, biological, radiological), plays a central role in all Soviet planning. As far as published information is concerned, the Soviet ground forces are more fully equipped for such warfare than any other in the world.

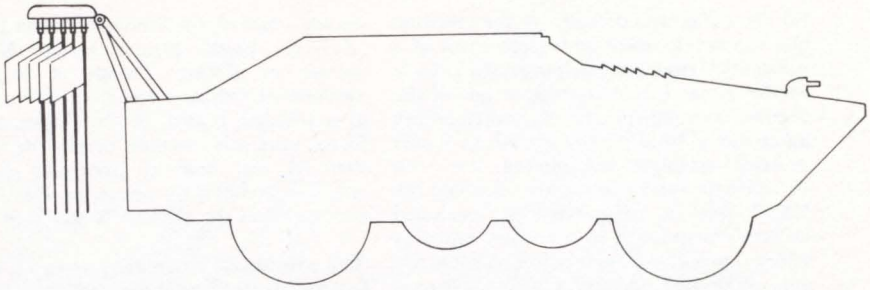
Means of Delivery.
All Soviet artillery pieces of 122mm calibre and over can be used to deliver persistent and non-persistent chemical agents, but in practice, the most likely weapon for the delivery of non-persistent agents is the BM-21. The density of fire of this area saturation weapon makes it ideal for this purpose. A battery of six such weapons could deliver 240 chemical shells to a target area in a few seconds. Persistent agents would most likely be delivered by the long-range D-74 122mm and M-46 130mm guns. Agents of both types can be delivered by aerial bombs or spray tanks from FGA aircraft of the Tactical Air Armies. Chemical warheads might well be used together with conventional explosives to delude the defender.

Agents.
The Soviet Union is known to hold stocks of several kinds of chemical warfare agents. These include:
Hydrogen cyanide compounds which cause rapid respiratory failure, but disperse very quickly. One contamination by this agent renders most types of gas mask and vehicle filter useless.
Nerve agents, developed from insecticides by German scientists during the last war; the most important of these are known by code letters—GA(Tabun), GB(Sarin), GD(Soman) and VX. Small amounts of these agents inhaled or absorbed through the skin cause malfunction of the nervous system and rapid death. These agents can be used in the persistent and non-persistent forms. Some nerve agents can be countered by antidotes or injections, but it is thought that the latest Soviet compounds may well prove difficult, if not impossible, to counter with present medicines.
Blistering Agents—developments of the mustard gas used so effectively in World War I. These are very persistent and produce incapacitating blisters and the vapour, if inhaled, causes death.

It is known that the Soviets maintain stocks of CW agents ready for use, and it is assumed that these would be issued to army formations as the result of a high-level political decision. All army units have the capability of delivery CW attacks, and divisional artillery recce is tasked to provide meteorological data for divisional staffs to plan their employment.







Top: **TMS-65 decontamination apparatus for rapid decontamination of vehicles and towed weapons.** *Above:* **BRDM-rkh Radiological-Chemical Reconnaissance vehicle with area warning flag emplacers.** *Below:* **plotting contamination limits for BRDM-tkh.**

In addition to this offensive capability, all army units and formations, unlike Nato armies, have integral chemical recce and defence elements for detection of contamination and marking of contaminated areas, and for mass decontamination of vehicles and personnel (see diagrams showing structure of motor rifle divisions). Every Soviet soldier has his individual NBC protective clothing and a decontamination kit, and all modern Soviet AFVs are capable of operating in a contaminated environment.

There are several types of Soviet NBC reconnaissance vehicles to detect and warn of contamination, at least 17 types of decontamination vehicle for vehicles, terrain and buildings, and nine types of mobile decontamination station for personnel and clothing. Some of these vehicles carry steam boilers whose output is automatically doped with an additive such as formaldehyde or ammonia. Others are tankers equipped with multiple sprays with special nozzle attachments, discharging alkali or other emulsions or fogs.

The smaller drawing shows the BRDM-rkh reconnaissance vehicle equipped with two sets of automatic emplacers for a total of 40 warning flags. The vehicle explores the boundaries of an infected zone and marks the limits by the 40 bright flags, each automatically driven into the ground by a firing chamber and propulsion cartridge. The larger illustration shows the TMS-65 decontamination vehicle, used for the mass cleansing of vehicles and large items such as radars and missiles. The 6×6 Ural-375E chassis carries a VK-1F turbojet engine and operator cabin, with swivelling and elevation controls. Tanks on the chassis and a towed trailer supply jet fuel and additive decontaminants, delivered by the jet over a line of infected equipment (either the latter or the TMS-65 can be driven past the other).

Whether the Soviets would in fact employ chemical weapons in anything less than total war is hard to predict. Their use is not without disadvantages, not the least of which is that the Soviet protective clothing degrades the soldier's fighting ability more than the equivalent NATO kit. Nevertheless, as the Soviets possess such a formidable offensive and defensive capability and are constantly developing new agents, it would seem prudent to assume that they might be tempted to resort to chemical weapons rather than to the politically more dangerous nuclear weapons if they found themselves in difficulties.

Strategic Rocket Forces

Dr James E. Dornan, Jr

No one today would challenge the assertion that the development and deployment of a substantial strategic nuclear striking force by the Soviet Union constitutes one of the decisive turning points of contemporary international history. The growth of Soviet strategic strength has altered the very structure of world politics, transforming the USSR from a self-proclaimed 'encircled fortress', surrounded by predatory capitalist states, into a global superpower, capable not only of dealing effectively with challenges to immediate Soviet interests but also of projecting its power and influence on a world scale. In the process, the Soviet diplomatic style and the pattern of Soviet behaviour in world politics has been substantially changed as well. The bluff and bluster of the Khrushchev era has been replaced by a new self-confidence and assertiveness, as the USSR manipulates client states in every major strategic region of the world and otherwise behaves as if the world correlation of forces has indeed shifted in its favour. Although the recent massive increases in Soviet strategic strength are a product of the procurement programmes of the last decade – indeed, the Strategic Rocket Forces (*Raketnye Voiska Strategicheskogo Naznacheniya* or Rocket Troops of Strategic Designation) themselves were not created as a separate branch of the Soviet armed forces until 1960 – their origins lie in the Stalinist era, and in particular in the strategic situation by which the USSR was confronted at the close of World War II.

The origins of strategic power

It is worth recalling at the outset that Soviet military doctrine and practice – unlike, for example, that of the United States – has always stressed the necessary connection between military power and politics, and in particular the impact of Soviet arms upon the course of the world revolution. In the years immediately following the 1917 Revolution, Soviet theorists attempted at length to develop a set of principles for translating military power into political gains, and in particular for profiting from the expected collapse of the capitalist governments in Western Europe. Several prominent writers argued directly that the Red Army itself should be assigned the dual task of defending the Lenin regime and of aiding revolutionary movements abroad. (Among such efforts were those in Persia, Mongolia and Tannu Tuva, all in 1921.) While the wasting effect of the Civil War upon the Soviet economy and Stalin's increasing absorption with domestic politics subsequently led to a de-emphasis of the doctrine of 'revolution by bayonet' in practice, formal Soviet doctrine continued to stress the significance of the military instrument in the revolutionary process. World War II was taken by Soviet thinkers as confirmation of the view that the maintenance of a powerful military capability was essential if the socialist camp was to fend off the forces of counter-revolution and exploit emergent political weaknesses in the capitalist camp.

Nevertheless, after World War II the USSR confronted an entirely new military situation: the need to prepare for a possible conflict with an adversary which was not

The familiar 'mushroom' cloud looms over a Soviet warhead test site

accessible by land, as Russia's traditional enemies had been, and which moreover was accustomed – and possessed the capability, most dramatically in the form of nuclear weapons – to utilise power at great distances from its homeland. While the precise manner in which Stalin viewed the world of 1945 remains a matter of scholarly debate, there is general agreement on his specifically military concerns. The USSR faced the need to deter the US from reacting vigorously to hostile political moves emanating from Moscow and from attempting to exploit political unrest in Eastern Europe; more generally, Stalin saw the need to usher the USSR safely through the period in which it would be vulnerable to Western strategic nuclear strength. His immediate solution was to emphasise, both operationally and in his declaratory policy, the continuing significance of land power, represented by mass armies defending a territorial heartland and operating on interior lines of supply and communications – the traditional Russian form of military power. Concretely, he may have consciously decided, as Thomas Wolfe has suggested in his *Soviet Power and Europe, 1945–1970*, to make Western Europe a kind of 'hostage' to ensure US good behaviour by deploying large forces with a substantial offensive capability in the satellite nations and in the Western USSR. In any case, Soviet land power became the counterpoise to US strategic strength.

At the same time, Stalin made substantial efforts to acquire both nuclear weapons and long-range delivery systems. A nuclear weapons research programme had been begun in the USSR as early as 1942. The first Soviet graphite reactor went into operation in December 1946, and, following several public claims that Soviet scientists had solved the problem of the atomic bomb, the first known atomic device was tested on 29 August 1949. Nearly four years later, the USSR exploded its first thermo-nuclear device.

Soviet development of delivery vehicles, although lagging somewhat behind accomplishments in the nuclear weapons field, also proceeded at a steady pace. USSR rocket technology originated in the early 1940s. Short-range tactical rockets were utilised freely in area bombardments during the final campaigns against the Axis in World War II. After the war the USSR took over large stocks of the German V-2 rockets, the type which had been used against London, and put captured German scientists to work on more advanced systems. By 1947 a small number of SS-1 'Scunner' SRBMs (short-range ballistic missiles) – essentially improved V-2s – had been deployed. The initial Soviet nuclear delivery vehicles, however, were aircraft suited mainly for use against European targets: Tu-4 'Bull' piston-engined medium bombers copied from four US B-29s which had made emergency landings in the Far East during World War II, and Il-28 'Beagle' light jet bombers. (The Tu-4 could, of course, have reached the US on a one-way mission or with air refuelling, but the Soviets did not develop a capability for the latter until the late 1950s.) Development of intercontinental bombers was also begun in the late 1940s. Moreover, although the

SOVIET STRATEGIC MISSILE TEST CENTRES AND RELATED FACILITIES

A: Kapustin Yar (48.4°N, 45.8°E). Early test centre for short and medium-range ballistic missiles: Soviet V-2, Shyster/Sandal, Skean. ABM tests with two-stage SL-8 fired towards Sary Shagan. Small Cosmos satellites since 1962.

B: Tyuratam (45.8°N, 63.4°E). Test centre for ICBMs launched to target areas Kamchatka Peninsula and central Pacific; small impact area for short/medium range missiles angled NE. Cosmos photo-reconnaissance (52°, 65° incl.), SIS, ocean surveillance, FOBS, etc.

C: Plesetek (62.9°N, 40.1°E). ICBM base (e.g. 65 × SS-13). Military meteorological satellites, Cosmos photo-reconnaissance (63°, 65°, 73°, 81° incl.), military comsats, early warning, ferret, multiple navsats (74° and 83°) SIS target.

D: Moscow. Galosh ABM defence site. Four complexes with 16 launchers apiece and associated radars.

E: Severomorsk. Major submarine base near Murmansk including Delta class submarines firing SS-N-8 SLBM's.

F: Barents Sea. Firings of SS-N-8 SLBM's from submarine to impact central Pacific (stellar-inertial guidance), October 1974.

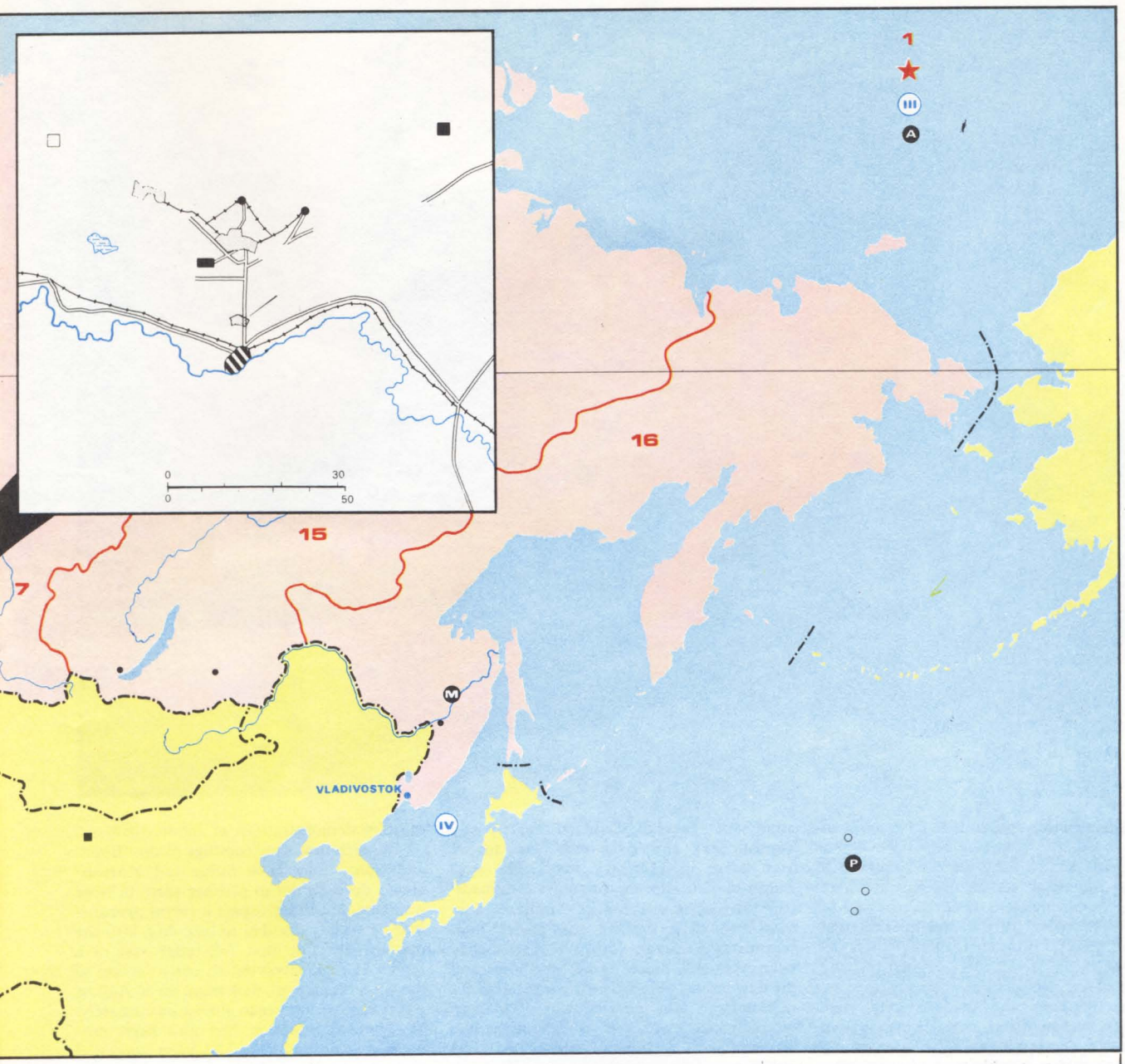
G: White Sea. Firings of SS-N-8 from submarine to impact near Kamchatka

ABM, anti-ballistic missile; SIS, satellite interceptor system; FOBS, fractional orbit bombardment system; ICBM, inter-continental ballistic missile; SLBM, sea-launched ballistic missile.

*Operational ICBM silos have been reported in various sectors of the Soviet Union, e.g. north-west USSR, Ural Mountains, Eastern Siberia; IRBM sites in Western USSR and central Asia covering Europe and Middle East, Eastern Siberia (near the border with Mongolia) covering the whole of the People's Republic of China. Some Scrooge and Scamp mobile launchers in West and East.

MILITARY DISTRICTS AND MAJOR FLEETS

1, Leningrad. **2,** Baltic (Riga). **3,** Belorussian (Minsk). **4,** Moscow. **5,** Carpathian (L'Vov). **6,** Odessa. **7,** Kiev. **8,** N. Causasus (Rostov-on-Don). **9,** Transcaucasus (Tbilisi). **10,** Volga (Kuybyshev). **11,** Urals (Sverdlovsk). **12,** Turkestan (Tashkent). **13,** Central Asian (Alma Ata). **14,** Siberian (Novosibirsk). **15,** Transbaikal (Chita). **16,** Far Eastern (Khabarovsk). **Fleets:** (I) Northern (Murmansk). (II) Baltic (Kaliningrad). (III) Black Sea (Sevastopol). (IV) Pacific Ocean (Vladivostok).



Peninsula, February 1974.

H: Novaya Zemlya. Major nuclear test centre; impact area for ICBM's launched from Soviet operational silos.

J: Semipalatinsk. Underground tests of ABM warheads (20-200 KT); kill mechanisms for ABM and SIS including (?) high-energy lasers and charged particle beams.

K: Severodvinsk. World's largest submarine yard, near Archangel, building Delta-class nuclear-powered submarines.

L: Gorki. Submarine yard building nuclear-powered Charlie-class vessels able to launch eight SS-N-7 missiles whilst submerged.

M: Komsomolsk. Second major submarine yard, on Amur River in Soviet Far East.

N: Sary Shagan. Anti-ballistic missile test centre including long-range ABM SH-4 and never high-acceleration ABM in Sprint class.

P: Pacific target areas: (a) SS-19 ICBM Jan. 1974 from Tyuratam; (b) SS-18 ICBM Feb. 1974; (c) SS-N-8 SLBM Oct. 1974 from Delta 2 class submarine, Barents Sea.

Chinese facilities

a. Lop-Nor nuclear test centre 40°20'N, 90°,10'E.

b. Shuang-Ch'eng-tze rocket test centre 41°N, 100°E.

creation of the long-range missile force has often been credited in Soviet historiography to Khrushchev, an ICBM (intercontinental ballistic missile) research programme apparently was established at Stalin's direction in 1948 as a follow-on to the work on the V-2 types. (The commander of the Soviet rocket forces, Marshal N. I. Krylov, has stated that research and development on long-range missiles started in the early postwar years.) Only one additional rocket of significance was deployed during the Stalinist years, however; this was the SS-2 'Sibling' SRBM, which embodied some improvements in range and reliability over the SS-1 and was deployed in small numbers.

Thus although it is probably in the main correct to conclude – as have most Western and Soviet writers – that Stalin did not adequately grasp the strategic and political implications of the new technology, such criticisms should not be pushed too far. Although his stress on the 'permanent operating factors' of war and on old doctrines and strategies generally, as well as the commanding position which he assigned to the army within the Soviet military hierarchy, helped to prolong the preeminence of a continental military outlook in Soviet strategic thinking, Stalin's public depreciation of the significance of nuclear weapons was a reasonable response to Soviet military weakness. And his declaratory policy was in any case belied by his decisions to expend a substantial portion of Soviet R & D (research and development) resources on modern nuclear weapons and delivery systems – decisions which laid the foundation for the Soviet strategic programmes of the Khrushchev and Brezhnev years and the rise of the USSR to a position of no less than strategic parity with the US.

The Khrushchev period

The death of Stalin and the rise to power of Georgi Malenkov set off a lengthy debate among Soviet theorists about the impact of the new weapons on war and international politics. Several prominent thinkers, including General N. A. Talenski, argued that the nature of war itself had been transformed by nuclear weapons and modern long-range delivery systems, and that the traditional advantages enjoyed by the USSR, stemming from geographic location and physical size, were by themselves no longer sufficient to ensure victory in the event of a major conflict with the West. A new doctrine was needed, in their view, which took into account the now-transcendent importance of strategic surprise; several leaders, including General Talenski, appeared to advocate a pre-emptive attack by the USSR in the event that an assault on the homeland appeared imminent. Above all, the USSR, in the view of Stalin's critics, had to be prepared to fight a nuclear war. Malenkov, on the other hand, in a series of 1954 speeches, appeared to take the position that a new war would mean the destruction of civilization, Soviet as well as Western. He moreover stated that when both sides possessed an adequate strategic nuclear force, there would exist a state of mutual deterrence; under such conditions, local and conventional wars were far more likely than general nuclear war.

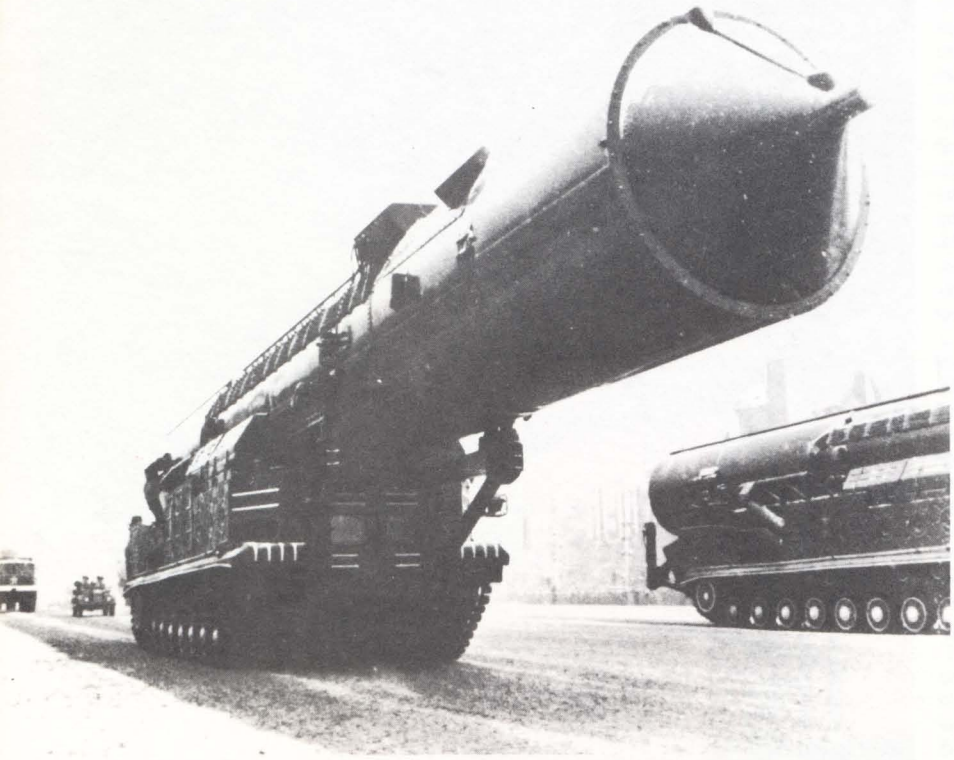
The position of Malenkov and his supporters was bitterly opposed by Molotov, Bulganin, Marshal Zhukov and other prominent generals, and ultimately by Khrushchev; and Malenkov was forced from office in February 1955. The new Bulganin–Khrushchev duumvirate immediately set out to shape a new military doctrine and to reorganise the Soviet high command. Generals loyal to Khrushchev were eventually placed in key positions, and the new strategy emphasised preparation for nuclear war. The development of modern weapons continued, and in some areas was accelerated. The SS-3 'Shyster' MRBM (medium-range ballistic missile), like its predecessors essentially an improved V-2, entered service in 1955, and was publicly displayed in Red Square on 7 November 1957. Moreover, the jet Mya-4 'Bison' and the turbo-prop Tu-95 'Bear' long-range strategic bombers had been publicly displayed in 1954 and 1955 respectively, and the Tu-16 'Badger' medium jet bomber was ready to enter the operational inventory. A modest force of the former was eventually deployed, along with some 1,300 'Badgers' assigned to both the strategic and naval air arms. (It was the July 1955 Moscow Air Show which gave rise to the widespread fears in the West that a significant 'bomber gap' had developed, putting the West at a serious strategic disadvantage in dealing with the USSR. But apparently the Soviets flew the same squadrons of 'Bisons' and a few 'Bears' repeatedly past the viewing stand, leading Western observers to conclude that the USSR had embarked on a large-scale build-up of heavy bombers. It has been observed that this air show was 'one of the most successful peacetime military demonstrations of modern times'.)

The technical shortcomings of the 'Bison' and 'Bear' may have influenced Khrushchev's decision not to procure them in large numbers, but in retrospect it seems probable that he simply decided to leap-frog into the missile age. The first full-range test of a Soviet ICBM, involving an early version of the SS-6 'Sapwood', took place on 26 August 1957; production began almost immediately. War-head production had also been proceeding rapidly. (It has also been suggested that war-head production outran that of strategic delivery systems, enabling these war-heads to be deployed in Europe, this in turn making possible the manpower reductions in the Soviet armed forces of the Khrushchev period.) Extensive nuclear weapons tests were carried out in 1958 and again in 1961, when a 58MT (megaton) weapon was exploded. In 1959 a further development of the 'Shyster', the SS-4 'Sandal' MRBM, entered deployment. With its relatively high reliability, a maximum range of 1,200 statute miles, and a 1MT war-head capability, the 'Sandal' quickly became a standard IRBM (intermediate-range ballistic missile) in the Soviet armed forces; 500 or so remain in service at present, deployed both in the western USSR and along the Sino-Soviet border. (Early versions of the SS-4 were radio-command guided, but later models incorporate inertial guidance. The 'Sandal' was one of the two types of Soviet missiles deployed in Cuba late in 1962.) The SS-5 'Skean' IRBM (intermediate range ballistic missile), followed two years later. Similar in appearance

Above left: **SS-9 Scarp was Russia's biggest operational ICBM until the SS-18 of the mid-1970s. It can carry a single 25 MT warhead or three multiple re-entry vehicles**

Above: **American spy satellites have spotted Scamp launchers near the Chinese border. Set up ready to fire, Scapegoat missiles (the missile portion of the Scamp system) have a range of up to 2,500 miles (4,000 km).**

Left: **SS-15 Scrooge, land-mobile strategic missile, on parade in Moscow. Scrooge missile launchers have been observed close to the Soviet frontier with Red China, and the UK and most of the Mediterranean fall within the 3,500 mile range of these solid-rocket propelled missiles.**



to the SS-3 and SS-4, but without fins, the 'Skean' has a range of 2,300 miles. About 100 were deployed, some in underground silos; most remain in service. Although generally said to mount a 1MT war-head, the SS-5 has also been reported to carry a large war-head in the 5–10MT range.

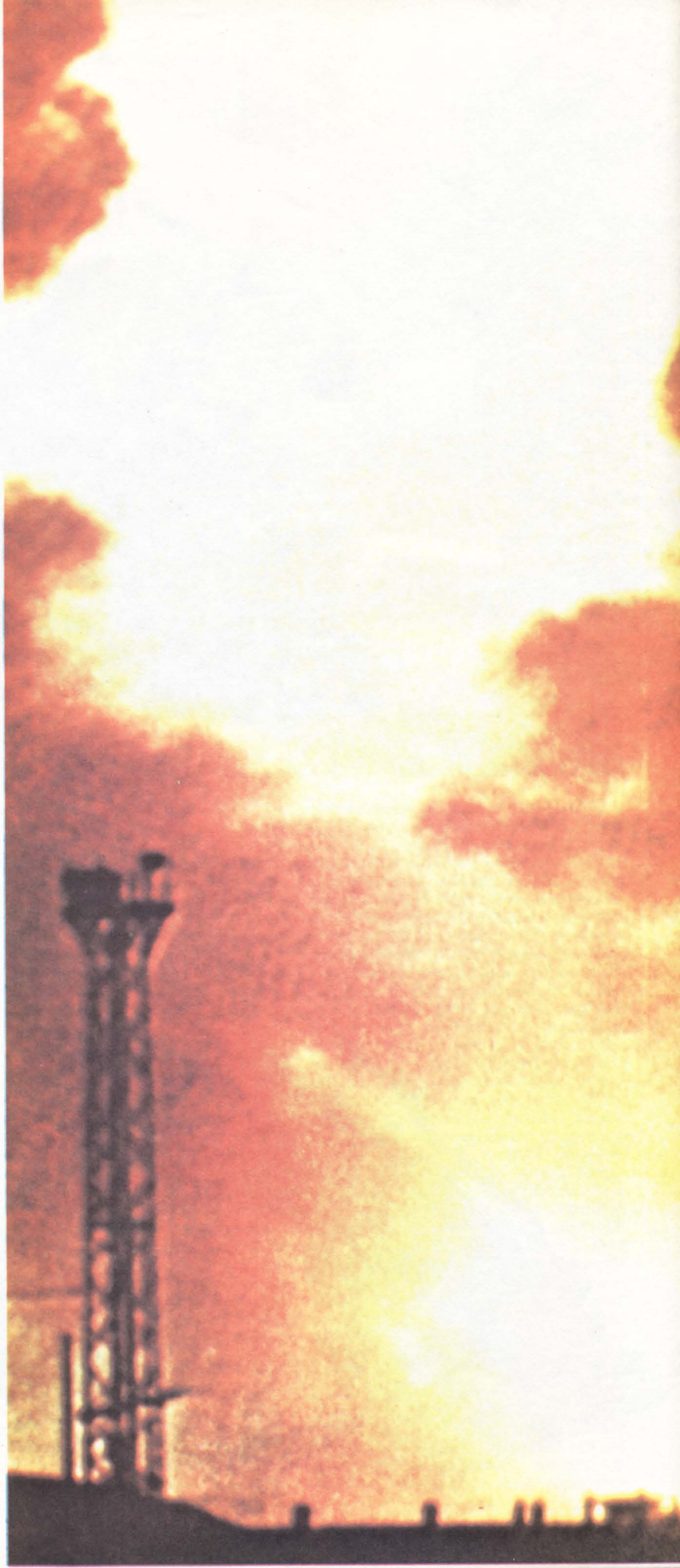
The seemingly rapid Soviet progress in the strategic weapons field undoubtedly helped stimulate Khrushchev to undertake another re-examination of Soviet strategic doctrine during the late 1950s. Apparently persuaded by Western behaviour at the Geneva Conference of 1955, by the lack of US action during the Hungarian revolution in 1956, and by the vacillating Western response to his 'rocket diplomacy' during

the Suez crisis and the Turkish-Syrian tensions of late 1957 that there was little chance that the West would initiate military hostilities against the USSR, he decided to rely on a 'minimum deterrence' posture both to ensure Soviet security and as the basis for an adventuresome political strategy against the West. In his assessment of world political trends at the 21st Party Congress in January 1959, he delivered his famous pronouncement that war was no longer 'fatalistically inevitable', not because the West had become more kindly disposed towards the socialist camp, but because a decisive shift in the world correlation of forces had occurred in favour of the communist world. In Khrushchev's view, the West would be increasingly deterred in the future from offering vigorous resistance to communist political initiatives. The advance of socialism was thus assured.

In a subsequent speech on defence issues, delivered before the Supreme Soviet on 14 January 1960, he developed this theme at greater length, and also set forth the principal elements of his military doctrine. Nuclear explosives and rocket weapons, he stated, had become the decisive factors in modern war. Under these conditions, although the USSR would of course be able to survive and triumph in any future war, no matter what the circumstances, the first phase of a future global conflict might well be crucial. War, he said, 'would start in the heart of the belligerent countries: there would not be a single capital, not a single major industrial or administrative centre, not a single strategic area which would not be subjected to attack, not only in the first days but in the first minutes of the war.' The USSR, he continued, must therefore reorganise its military forces to take account of these factors. In the future, the most important component of the Soviet armed forces would be the Strategic Rocket Forces; research, development and procurement of the most modern rocket weapons would consequently be stepped up substantially. There would be corresponding cuts, Khrushchev concluded, in conventional forces, particularly in the army.

On 7 May 1960, when the Strategic Rocket Forces were elevated to the status of an Armed Service, on a par with the Ground, Air, Air Defence and Naval Forces, under the command of Marshal K. S. Moskalenko, the shift in Soviet doctrine away from a purely continental, land power strategy to one which took fully into account the revolutionary impact of the new weaponry was completed. All offensive missiles with a range of more than 1,000 kilometres (620 statute miles) were assigned to the Strategic Rocket Forces (missiles of lesser range, designated as 'operational-tactical' missiles in Soviet terminology, are assigned to the Ground, Air, and Naval Forces). Work on the second generation ICBMs by 1960 was already far advanced; the first of these, the SS-7 'Saddler', about which little is known even today although nearly 200 have been deployed, began to enter service late in 1961; the SS-8 'Sasin', like 'Saddler' a two-stage storable liquid-fuel ICBM with a 5MT war-head and a range of nearly 7,000 miles, entered deployment two years later.

Nevertheless, Soviet ICBM progress was not nearly as rapid as Khrushchev had



expected during the heady days of the first '*Sputnik*' launchings. From the time of the first tests in late 1957 to mid-1961, only a handful of ICBMs was actually deployed; Western intelligence sources credited the USSR with only 10 operational SS-6s as of late 1959. It is now clear that technical complications with the 'Sapwood' were primarily responsible for the slow development rate. Electronics difficulties and problems with the non-storable liquid fuel system led to extremely poor accuracy and low reliability; moreover, the missile required 'soft' emplacement (unprotected against nuclear explosion) in above-ground launching pads and a lengthy pre-launch preparation period. (It has been suggested that one motive for Khrushchev's exaggerated claims for Soviet progress in strategic weaponry during the 1959–1960 period was to conceal from the West his decision not to deploy extensively the first-generation SS-6.)

After the Cuban missile crisis, the deployment pace quickened somewhat. Moskalenko was succeeded by Marshal S. S. Biryuzov in 1962: The Soviet ICBM total had reached 200 by the time of Khrushchev's ousting, with perhaps one-third of these second-generation 'Saddlers' and 'Sasins'. Many of the latter were deployed in dispersed and 'hardened' (protected against nuclear explosion) launchers. An entirely new generation of ICBMs was in the development stage. By this time also MRBM and IRBM deployments had reached their peak of perhaps 750, all of them SS-4 'Sandal' and SS-5 'Skean' types. The Strategic Rocket Forces now consisted of 110,000 men, under the command of Marshal N. I. Krylov, who succeeded Biryuzov in 1963. (Too much is made of the Cuban crisis as a motive for the post-1962 Soviet missile build-up. Khrushchev's retreat in the face of the US ultimatum certainly helped to strengthen Soviet resolve to catch up with the United States as quickly as possible, but it certainly does not by itself explain the size of the Soviet deployments in the late 1960s.) But the unsatisfactory outcomes of the Cuban affair and the campaign against Berlin made it clear that, despite the pronounced shift in doctrine, resources and deployment from conventional to strategic forces which Khrushchev instituted, he had failed to develop a military posture sufficient to support the assertive political strategy he desired. Along with difficulties in the domestic economy for which he was also held accountable, his strategic failures helped bring about his political demise.

From inferiority to parity plus

Throughout the 1950s and early 1960s there were numerous indications that Khrushchev's ideas on military strategy and on the appropriate force posture for the USSR were encountering opposition within the Soviet military bureaucracy. His decision to accord primacy to nuclear weapons and strategic missiles was one of the issues on which he encountered particularly sharp criticism, and after he was retired his successors once again altered Soviet doc-

Left: **A Soviet medium-range ballistic missile blasts into action from a hidden silo. Many such missiles cover targets in Europe from Western parts of the Soviet Union**

trine. His 'single option' strategy was modified, and his apparent belief that all wars between the socialist and capitalist camps must inevitably and quickly escalate to the holocaust level was gradually – if subtly – modified. At the same time, Brezhnev and Kosygin jettisoned the 'minimum deterrence' strategic posture on which Khrushchev, in part out of necessity, based his activist foreign policy between 1958 and 1962.

Generally speaking, the policies of the Brezhnev era have been directed toward improving the global power position of the Soviet Union. This meant that the USSR had to improve substantially its position in the strategic balance *vis-à-vis* the US, and develop the capability to project its military power and political presence into the farthest reaches of the globe. It is of course the former that concerns us here. Shortly after assuming power the regime made the decision to accelerate considerably the missile procurement programme set in motion during Khrushchev's last years, and by late 1966 deployment of two third-generation ICBMs – the SS-9 'Scarp' and the SS-11 'Sego' – was proceeding at the rate of one every two days.

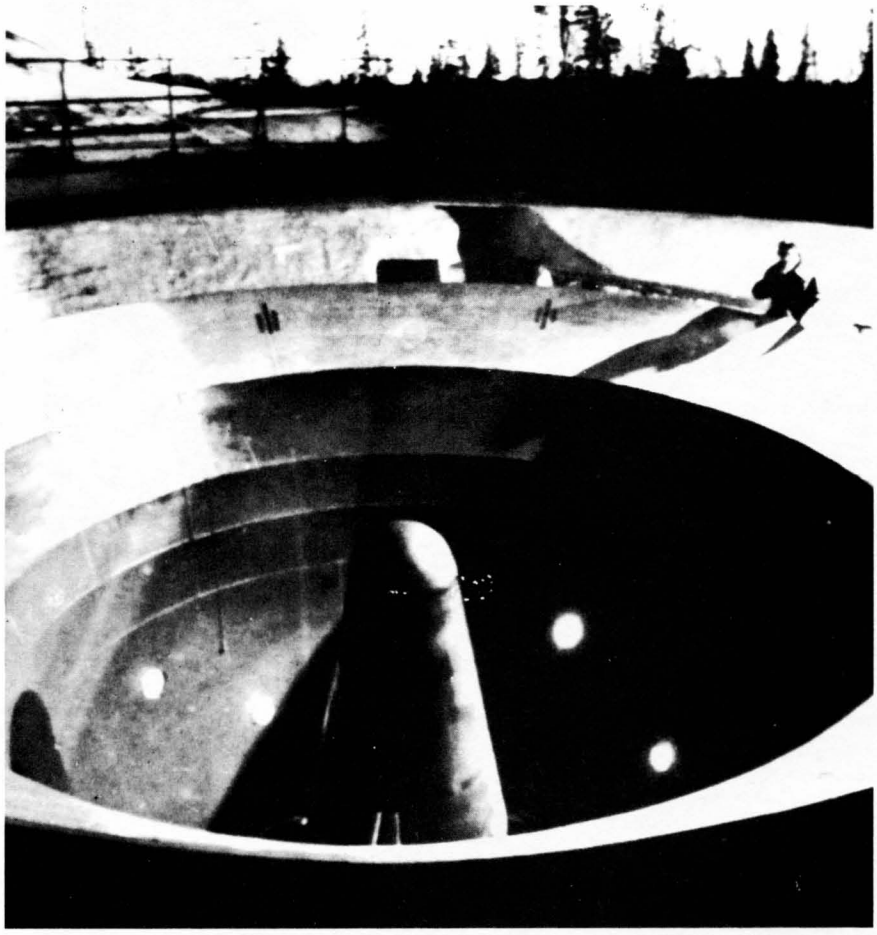
The 'Scarp', the earliest version of which appeared in 1965, is a particularly impressive weapon; it is approximately 35 metres long and 3 metres in diameter, with a throw-weight (payload) of at least 12,000 pounds. The 'Mod 1' and 'Mod 2' versions carry single large war-heads of up to 25MT. The Soviets also began testing in 1966 a fractional orbital bombardment (FOBS) version of the SS-9, designed to deliver its weapon from a satellite before completing a single orbit; the SS-9 was also tested later in a depressed trajectory mode.

The SS-11 'Sego', which followed in 1966, is, like the 'Scarp', a three-stage missile using a storable liquid propellant; early versions carried a single war-head in the 1–2MT range. Due to unimpressive accuracy the 'Sego' has from the start been regarded as a soft-target, or 'countervalue', weapon. It has been deployed in large numbers – approximately 960 of the 'Mod 1' and 'Mod 2' were in position by 1973, most in underground silos constructed in a broad belt 250 miles wide and 3,000 miles long, beginning east of Moscow and ending near Chita, east of Lake Baikal. The SS-10 'Scrag', another very large ICBM, was shown in Moscow parades beginning in 1965; it was apparently not deployed, however, and may have been a prototype or transition missile presaging the later SS-18. Also in this period the first Soviet solid-fuel missile, the SS-13 'Savage', reached the deployment stage, along with an IRBM variant using the upper two stages, the SS-14 'Scapegoat'. (The SS-14, when considered with its associated erector/transportation system, is known as 'Scamp'.) These missiles were beset with various technical difficulties, however, and were deployed only in small numbers, beginning in 1968. The earliest Soviet multiple re-entry vehicles (MRVs) were also tested in 1968 (unlike the more sophisticated multiple independently-targeted re-entry vehicles, or MIRVs, MRV war-heads cannot be directed at widely separated targets).

By early 1970 the USSR had passed the US in numbers of operational ICBMs (see Chart 1). By February 1970, 275 SS-9s had been deployed, with a combination of war-head yield and accuracy sufficient to cause concern in the United States and elsewhere that the Soviets were on the verge of acquiring a hard-target capability against the US Minuteman ICBM force. Finally, early in 1970 a 'Mod 2' version of the SS-11, with a more accurate re-entry vehicle, was tested.

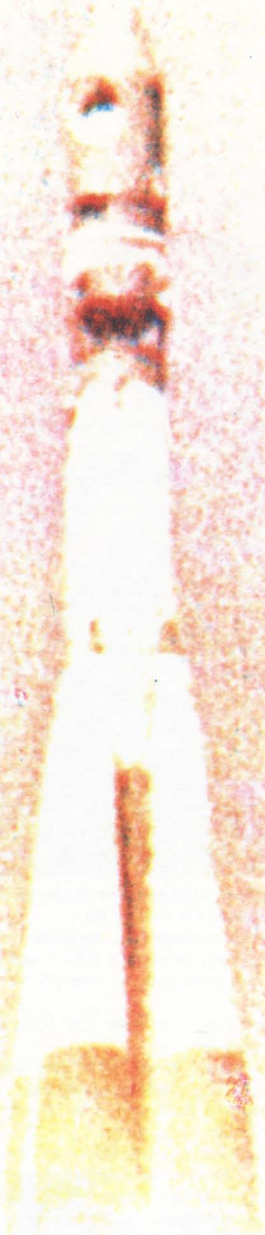
The Strategic Rocket Forces by now numbered some 350,000 men. They had become the most widely publicised component of the Soviet armed forces within the USSR. The commander-in-chief of the Strategic Rocket Forces always takes precedence over the other service commanders-in-chief, regardless of actual rank. High position in the Strategic Rocket Forces, in fact, seemed increasingly a path to even greater prominence: after the death of Defence Minister Malinovskiy in 1967, there were rumours that Marshal Krylov was a leading candidate for the position, and in the autumn of 1970 Colonel-General N. N. Alekseyev of the SRF was made a Deputy Defence Minister, and apparently put in charge of co-ordinating all strategic weapons development programmes. When Krylov died in May 1972, his one-time deputy, General V. F. Tolubko, became commander of the Strategic Rocket Forces.

By the time of SALT-1, then, the Brezhnev regime had more than achieved its initial objectives of 1964. The 1972 Interim Agreement on Offensive Weapons permitted the USSR to complete deployment of all ICBM (and SLBM, or submarine-launched ballistic missile) launchers under construction as of 1 July 1972; strategic missile-launcher levels were frozen at that level. The Soviets were thus guaranteed a substantial advantage over the United States – no less than 1,408 to 1,054, depending on how many of its older missiles each side chooses to trade in for new SLBMs – in numbers of ICBM launchers. Each side was also allowed to upgrade qualitatively its missile force; thus the long-anticipated Soviet development of MIRV war-heads would not be restricted. Nor were any limits imposed on the USSR's emergent 'cold launch' or 'zero stage' technology, by which ICBMs are propelled from their silos by compressed gas and ignited above ground. The latter development is particularly significant, in that it obviates the need for extensive shielding inside the silo, thus permitting both the deployment of much larger missiles per silo and reasonably rapid re-use of the silo itself. When coupled with continued Soviet progress in the modernisation of their Air, Naval and Ground Forces, the



Above: **Close-up of a Soviet missile silo. Similar sites have been built in birch and fir forests. The heavy covers slide to one side on rails**

Right: **Russia's early lead in space was made possible by a large ICBM tested in August 1957. Developed over the years, it has launched Vostok (seen here), Voskhod and Soyuz manned spacecraft**



strategic advantages guaranteed the USSR at SALT-1 meant that they had achieved no less than military parity with the US – a fact which was widely acknowledged by Western experts.

It was the hope of the United States government that the SALT-1 agreement would stabilise the strategic competition between the superpowers. The more advanced technology of the American strategic forces was said to compensate for any disadvantages by the Soviets under the accord. The willingness of the USSR to accept severe constraints on deployment of a missile-type ABM (anti-ballistic missile) system, some commentators argued, indicated that the Soviets might be moving towards acceptance of an 'assured destruction' strategic posture and away from the 'war-fighting' doctrine implicit in much past Soviet military thinking. On this basis, it was suggested, *détente* might over a time become more than a slogan.

It soon became clear, however, that the Soviets intended to exploit fully the opportunities for further force improvements provided them under the SALT-1 accord. Their strategic force build-up since 1972 has proceeded at a pace which former US Defense Secretary Schlesinger termed 'unprecedented in its breadth and depth'. During the past 36 months the Soviets have tested and deployed a 'MRVed' version of the SS-11 'Sego', with more accurate re-entry vehicles. An entire new generation of ICBMs has been tested and is being deployed: the SS-16, a solid-fuel missile designed for deployment in both a fixed and a mobile mode; the SS-17, a soft-target weapon utilising 'cold-launch' technology and deploying four MIRVs; the SS-19, with a volume 56% larger and a throw-weight four times greater than that of the SS-11 and deploying at least four MIRVs; and the giant SS-18, also utilising 'cold-launch' and capable of carrying either a 50MT war-head or eight large hard-target war-heads. All four have new bus-type post-boost vehicles and war-heads with higher re-entry speed coefficients for greater accuracy. (For characteristics of Soviet missiles, see Chart 2.) The silo-hardening programme also continues; some reports indicate that the newest silos can withstand overpressures in excess of 3,000 psi (pounds per square inch). Ten or more additional strategic systems are reported to be under development, including a two-stage mobile version of the SS-19, with a range of 6,335 statute miles, and other longer-range follow-ons to the SS-19. A two-stage IRBM version of the SS-16, designated the SS-20, was extensively tested in 1975. (The USSR tested 371 large rockets in 1973 alone.) There are thus no indications that the Soviets plan to rest content with their fourth-generation ICBMs.

Neither is there any sign that the SALT-2 agreement, if concluded on the basis of the framework agreed upon by President Ford and Mr Brezhnev at Vladivostok in November 1974, will in any way constrain planned Soviet deployments. Under the terms of the agreement each side will be permitted to 'MIRV' up to 1,320 strategic missiles; there are no restrictions on SS-19 deployments or utilisation of 'cold-launch' techniques. Given the greater throw-weight of Soviet ICBMs,

Chart 1 *Historical Comparison of USSR–US ICBM Strength, 1960–1975*

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*	*1967*
USSR	35	50	75	100	200	270	300	460
US	18	63	294	424	834	854	904	1,054
	1968	*1969*	*1970*	*1971*	*1972*	*1973*	*1974*	*1975*
USSR	800	1,050	1,300	1,510	1,550	1,575	1,590	1,599*
US	1,054	1,054	1,054	1,054	1,054	1,054	1,054	1,054

*Peaked at 1,618 in mid-year, before phase-out of SS-7 and SS-8s began.

Source: The Military Balance, 1969–70 and 1975–76, and Ray S. Cline, *World Power Assessment* (Washington, D.C.: Center for Strategic and International Studies, 1975), p. 57.

Chart 2 *Characteristics of Soviet Strategic Missiles, 1975*

Type	*Number Deployed*	*Year Initially Deployed*	*Max. Range (statute miles)*	*No. of Warheads*	*Warhead Yield*	*Throw-weight in 1,000 lb*	*Est. CEP (nautical miles [1])*
SS-4 Sandal	500	1959	1,200	1	1MT	n.a.	n.a.
SS-5 Skean	100	1961	2,300	1	1+MT	n.a.	n.a.
SS-7 Saddler	170[2]	1961	6,900	1	5MT	3	1+
SS-8 Sasin	19	1963	6,900	1	5MT	3	1+
SS-9 Scarp (Mod. 1 & 2)	250	1965	7,500	1	18–25MT	12	.25+
SS-9 Scarp (Mod. 4)[3]	38	1971	7,500	3 MRV	5MT	12	.25
SS-11 Sego (Mod. 1 and 2)	926[4]	1966	6,500	1	1–2MT	1.5	.55
SS-11 Sego (Mod. 3)	66	1973	6,500	3 MRV	300KT[5]	1.5	.5
SS-13 Savage	60	1968	5,000	1	1+MT[6]	1	1.1
SS-14 Scapegoat[7]	unknown	1968	2,500	1	1MT	n.a.	1+
SS-16	n.a.	1975	6,300	1	1+MT	2	n.a.
SS-17	10	1975	6,500	4 MIRV	1MT	4.5	.25
SS-18 (Mod. 1)	10	1974	7,500	1	25MT[8]	15[10]	.25
SS-18 (Mod. 2)	n.a.	1975	7,500	5–8 MIRV	2MT[9]	15	.25
SS-19	50	1975	6,500	4–6 MIRV	340KT	6[11]	.25
SS-20[12]	n.a.	—	2,000+	1	1+MT	n.a.	n.a.

Sources: The Military Balance, 1975–76; Ray S. Cline, *World Power Assessment* (Washington, D.C.: Center for Strategic and International Studies, 1975); other sources as indicated in notes.

[1] Estimated CEPs are drawn from a variety of published sources.

[2] The Soviets have begun phasing out older ICBMs, as specified by SALT I, in order to increase numbers of SLBMs beyond those deployed or under construction as of 1 July 1972.

[3] The SS–9 Mod. 3 is the FOBS.

[4] Includes approximately 100 deployed within MRBM-IRBM fields. A number of SS-11 silos were modified during 1975 to receive SS-17 and SS-19 missiles.

[5] Earlier reports indicated that the SS-11 MRV warhead had a yield of 500KT; see *New York Times*, 1 October 1972.

[6] Unconfirmed reports indicate that some SS-13s were deployed with 3 MRVs, probably similar to the SS-11 Mod 3 package.

[7] The SS-14 consists of the upper two stages of the SS-13.

[8] There have been persistent reports that some SS-18 Mod 1 will be deployed with a 50MT warhead; see, e.g., Clarence A. Robinson, Jr., 'Soviets Hiding Submarine Work', *Aviation Week and Space Technology*, 11 November 1974, p. 14.

[9] The Soviets have recently tested several new large warheads in the 3–6MT range; these could be deployed on the SS-18 or on more advanced missiles.

[10] Other reports indicate a throw-weight of 16,500 lb for the SS-18.

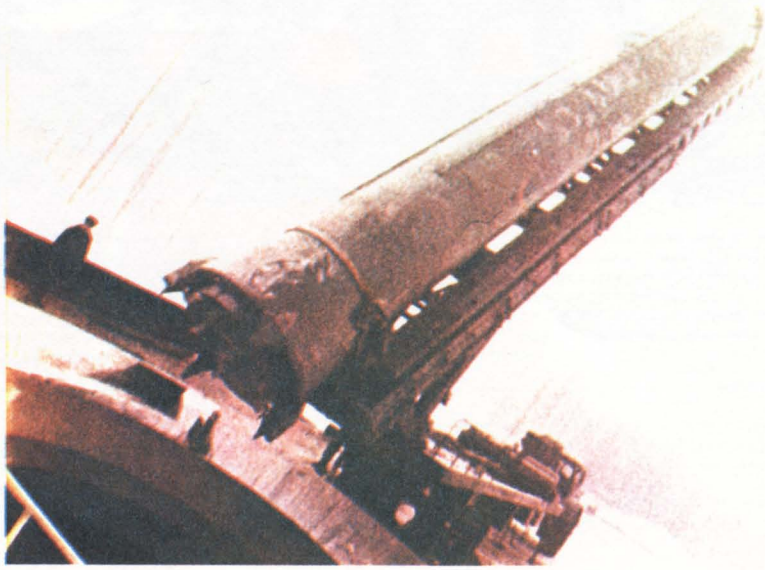
[11] Similarly, some reports indicate a throw-weight of 10,000 lb for the SS-19)

[12] The SS-20, extensively tested during 1975, consists of the upper two stages of the SS-16. One source (Aviation Week and Space Technology, 31 May, 1976) indicated SS-20 consists of first two stages of SS-16, range exceeding 3,000 miles.

Above: **A launch silo showing the gap between the missile and silo walls required for a 'hot' launch. Latest 'cold launch' techniques allow larger missiles to use the same silo**

Below left: **Forerunner of a new generation of submarine-launched ballistic missiles, SS-N-6 Sawfly has been operational in Yankee class submarines since 1968. Delta-class vessels carry the SS-N-8 with longer range.**

Right: **A test missile of the SS-4/SS-5 family being lifted by its transporter-erector for installation in the launch silo. Fuelled with storable liquids, it can be kept ready to fire**



the agreement would thus virtually guarantee that the Soviets will be able, within the next decade, to deploy more war-heads on land-based missiles than the United States. Moreover, these war-heads will be larger and, assuming certain improvements in accuracy, highly counterforce-effective against hardened targets such as US Minuteman silos: a 4MT war-head with a circular error probable (CEP) of 0.29 statute mile would have a 95% kill probability against a silo hardened to withstand 300 psi overpressure. Neither does the agreement restrict deployment of mobile ICBMs, in which the Soviets have exhibited increasing interest in recent years.

It would be idle at this point to speculate on the motives inspiring the continuing expansion in the capabilities of the Strategic Rocket Forces. It can be said with some assurance only that the Soviets show no sign either that they are satisfied with the 'rough parity' with the US which they achieved through SALT-1, or that they view a state of 'mutual assured destruction' as an adequate basis on which to fashion their force posture. It may be, as some commentators have suggested, that the USSR remains obsessed with a 'more is better' approach to weapons procurement, and that neither Soviet political nor military leaders are acting on the basis of a master plan to achieve strategic superiority over the US. Strategic superiority, as has often been pointed out, is in any case both difficult to define and to achieve under contemporary circumstances. But there can be no doubt that the Soviets have acquired a strategic capability not only more than sufficient to deter any attack on the USSR, but one which may also enable them to support the sort of aggressive global political strategy which Khrushchev attempted 15 years ago.

STRATEGIC MISSILES

Surface-to-surface

SS-4 Sandal

A medium-range ballistic missile, it was first seen in a Moscow parade in 1961. It followed an earlier missile of the same class, the SS-3 Shyster, which incorporated some of the older V-2 technology. Shyster's engine was a single-chamber RD-103 developed between 1952-53, for which propellants probably were liquid oxygen and a hydrocarbon fuel (kerosene?). Its successor, the SS-4, employed storable liquids which facilitated handling in the field and allowed missiles to be kept at instant readiness. This was the weapon involved in the Cuban crisis of 1962 which threatened south-eastern parts of the United States from sites which had been hastily constructed in Cuba. Its maximum range was about 1,800 km (1,100 miles).

Sandal also differed from Shyster in having a new four chamber engine, smaller tail fins and a flared skirt over the engine bay. Use of a storable propellant allowed some models to be launched from silos in the USSR. Trials were made from Kapustin Yar.

Sandal was to be adapted as the first stage of the small Cosmos satellite launcher which inaugurated the Cosmos programme at Kapustin Yar in March 1962. It has since been disclosed that the first stage has a four chamber RD-214 engine of 74 tonnes vacuum thrust, a chamber pressure of 45 atmospheres and a specific impulse of 264 sec. Propellants are nitric acid and kerosene.

SS-5 Skean

Basically an enlarged Sandal, the SS-5 was first deployed in 1964. Silo-launched, it had a maximum range of 3,200 km (2,000 miles). The missile was deployed with SS-4s in Western parts of the Soviet Union, targeted on Western Europe.

The engine type had not been revealed at the time of writing but its propellant is certainly storable and is possibly nitric acid and kerosene.

Skean, too, has been developed as a satellite launcher by the addition of a second stage.

SS-6 Sapwood

The SS-6 was Russia's first ICBM. It was tested in great secrecy in August 1957 and announced as having flown "at . . . unprecedented altitude . . . and landed in the target area." It was also responsible for Russia's early space lead. Fuelled with kerosene and liquid oxygen (and requiring immense support facilities) it comprised a central core and four strap-on boosters. Firing at lift-off were no fewer than 20 main thrust chambers and 12 small swivel-mounted verniers – small motors for fine control of speed and direction.

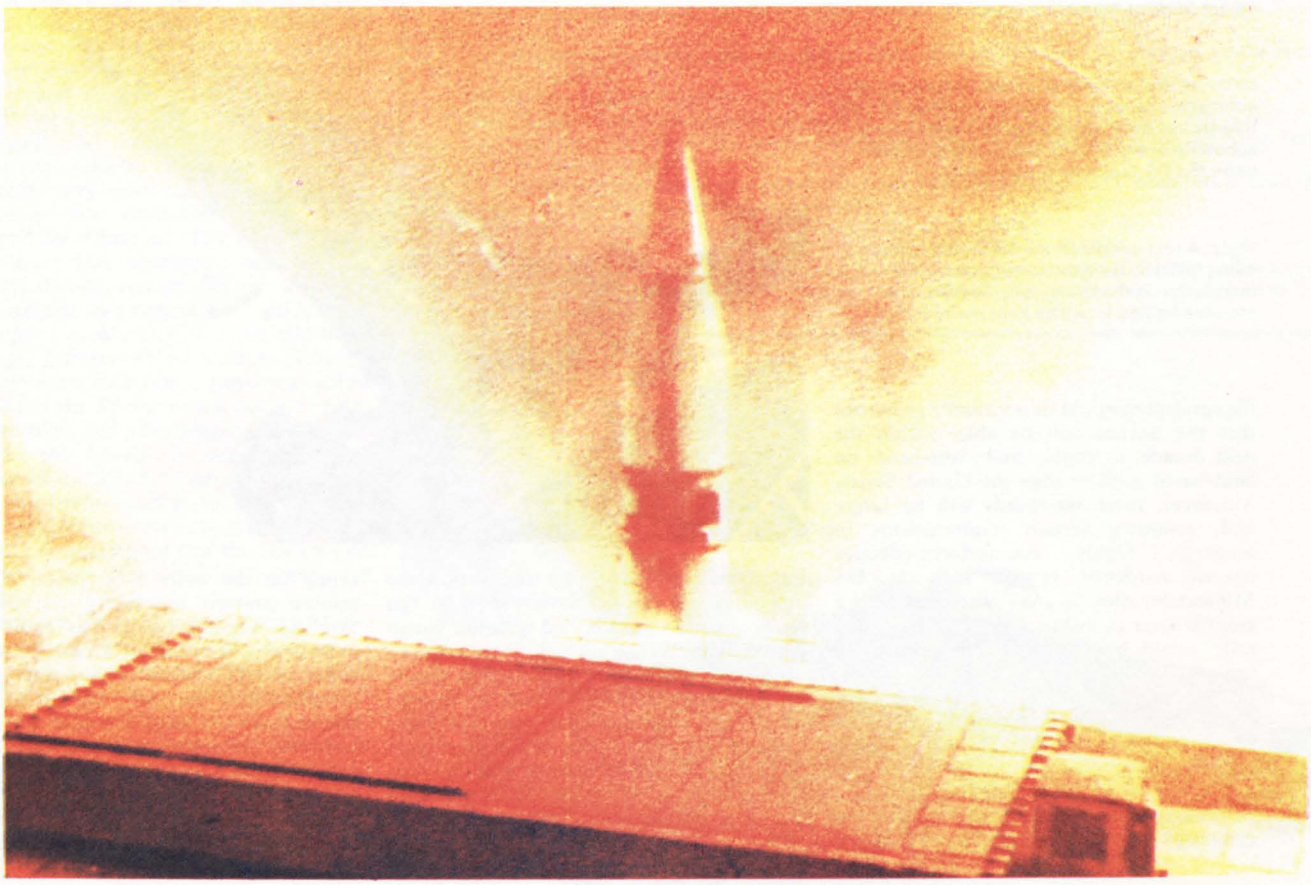
A virtually unmodified SS-6 launched the first Sputnik on 4 October 1957. With an upper stage fitted, on 12 April 1961 it sent Yuri Gagarin, the world's first spaceman, into orbit aboard Vostok 1.

The engine of the central core was the RD-107 of 96 tonnes vacuum thrust; the four boosters had RD-108 engines of 102 tonnes vacuum thrust.

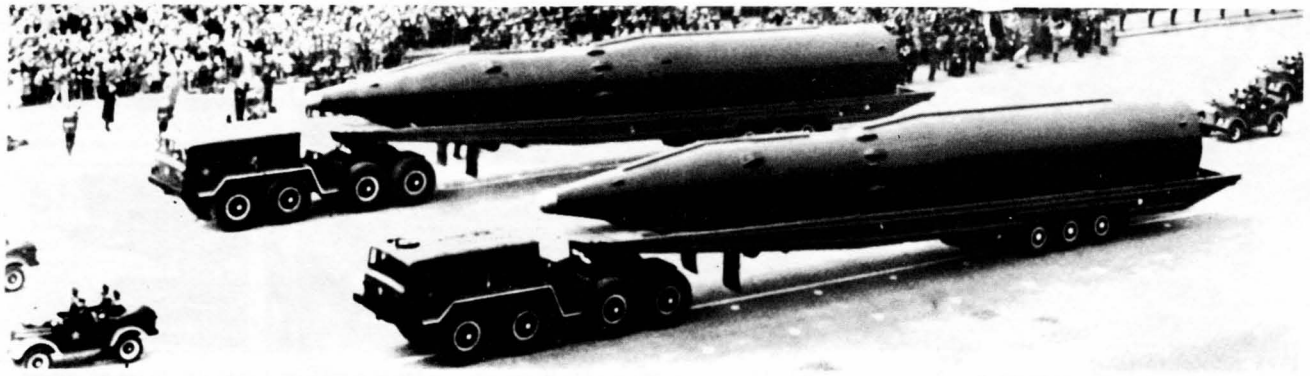
Improved versions of the same basic rocket are still in use for launching Soyuz manned spacecraft and various unmanned Earth satellites and space probes.

SS-7 Saddler

The mainstay of the Strategic Rocket Forces in the early years, the SS-7 first entered service in 1961. It did not appear in Moscow military parades but is known to be a two-stage, storable liquid ICBM approaching the size of the US Titan II. Although now obsolescent, it has been deployed in both hard and soft sites alongside the SS-8 Sasin. As many as 190 may have seen service over the years (one 1973 report quotes 98) and a large number were launched on test. SS-7s are now being replaced by new-generation ICBMs and a growing family of submarine-launched ballistic missiles (see SS-N-8 entry in table).



SS-8 Sasin



First seen in a Moscow military parade in November 1964, Sasin is in the ICBM class. The 24 m (80 ft) long two stage rocket has a maximum range of about 11,000 km (6,800 miles). The transporter is a six wheeled trailer hauled by a large eight wheeled fully enclosed tractor.

The rocket itself, which employs storable liquid propellants, consists of a cylindrical first stage and a top stage of smaller diameter with 'blow out' interstage fairings. On the example seen in Red Square the engine nozzles were concealed by a disc like weather cover but four mounting brackets indexed at 90° around the base gave evidence that the flight path was controlled by steerable exhaust vanes. There were no aerodynamic surfaces.

The technology of this missile bore a close resemblance to that applied in the SS-5 Skean.

SS-9 Scarp

The largest missile in the Soviet armoury before the appearance of the SS-18, the Scarp has been widely deployed in silos. It has two stages, employs liquid storable propellants and was first displayed in Moscow in November 1967. The engine type had not been revealed at the time of writing but the first stage has six fixed thrust chambers and four swivel-mounted verniers for thrust vector control and velocity adjustment.

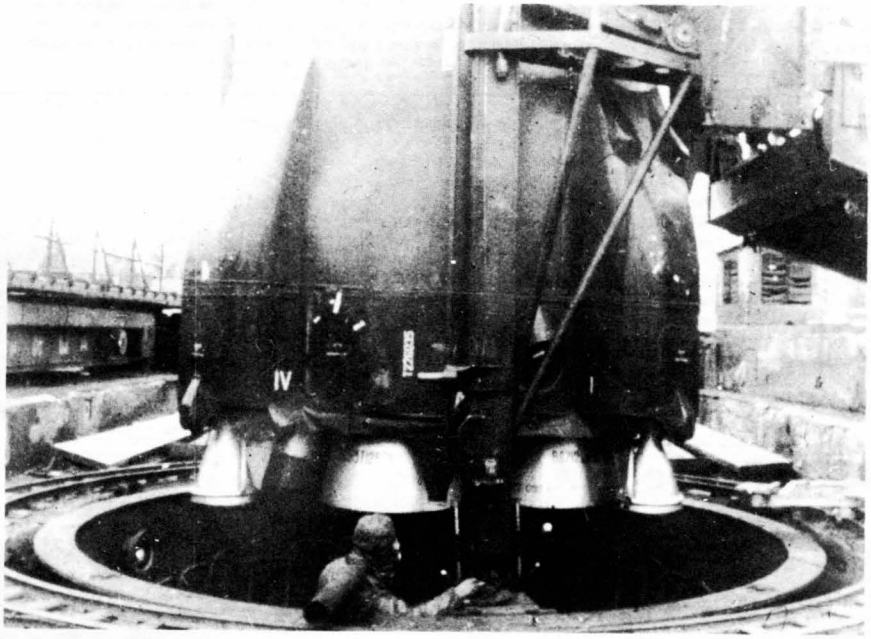
Four main versions are acknowledged by the US Department of Defense:

Mod 1. Entered service in 1965 with a single re-entry vehicle of about 20 MT explosive yield. Principal objectives, Titan and Minuteman ICBM bases within the USA.

Mod 2. The standard weapon which carries a single very high yield (25 MT) warhead.

Mod 3. Employed for tests of a depressed-trajectory technique, which sacrifices some range, and Fractional Orbit Bombardment System (FOBS). Instead of rising some 1,290 km (800 miles) into space on arching trajectories, as with conventional ICBMs launched over the Northern Hemisphere, FOBS vehicles go into temporary orbit close to the Earth before being cut down by the action of rocket braking. (Example: Cosmos 298, orbit ranged between 127 and 162 km (79 and 101 miles) inclined at 49.6 deg to equator). The test vehicle re-entered the atmosphere at the end of one orbit, presumably under surveillance by Soviet radars at Emba and other centres.

Operationally, such missiles would be aimed to enter the United States through the 'back door' of the South Pole, skirting the BMEWS advance warning radars in England, Greenland and Alaska. However, the advantage of 'surprise' would be offset by reduced target accuracy. US surveillance radars – including the advanced planar radar at Eglin AFB, Florida, which became operational in 1968 and south-looking SLBM radars – now alert the US southern flank.



Mod 4. Employed for tests of MRVs (multiple re-entry vehicles) and MIRVs (muliple independently-targetable re-entry vehicles). Early tests ended November 1970; new tests began January 1973.

More recently, a fifth model has been identified with an 'anti-satellite' test programme (SIS, satellite interceptor system) launched from Tyuratam. Some recent 'targets' appear to have been launched from Plesetsk by a missle derived from the SS-5 Skean family. Normally, the 'interceptor' having manoeuvred in orbit achieves a close pass of the 'target' on the descent leg of a wider elliptical orbit. Possible 'kill' techniques include warhead fragmentation, nuclear bursts and, eventually, high-energy pulsed lasers.

SS-10 Scrag

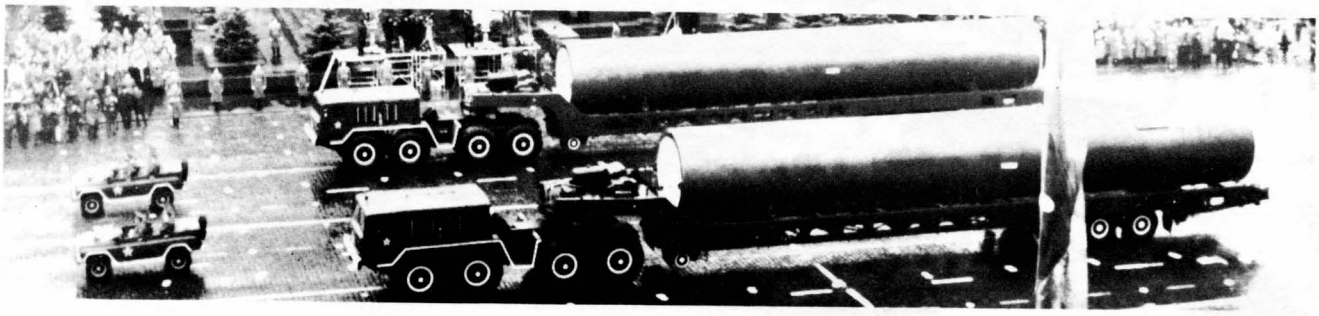
Developed in parallel with the SS-9, Scrag seems to have been abandoned following successful testing of the former missile. It first appeared in a Moscow parade in 1965.

Not only was the three-stage rocket less advanced than its companion, it had the disadvantage of using cryogenic propellants which meant that it could not be stored for long periods in a ready condition.

First stage control was achieved by swivelling the four thrust chambers. The first stage engine may have been related to the RD-111 which employed liquid oxygen and kerosene (vacuum thrust 166 tonnes, chamber pressure 80 atmospheres, specific impulse 317 sec).

The missile itself was characterised by interstage trusses separating the stages.

SS-11 Sego



Unlike its solid-propellant SS-13 counterpart, the SS-11 did not appear in a Moscow military parade with other rockets of its day, which marked it out as something special. It has, in fact, been in service with the Soviet Strategic Rocket Forces since 1966 in silos West and East of the Urals.

The US Department of Defense acknowledges three versions:

Mod 1, tested over a wide range of distances up to about 10,500 km (6,525 miles) with a single re-entry vehicle.

Mod 2, a non-operational test vehicle.

Mod 3, the operational model deployed with three 500 KT re-entry vehicles. The number of SS-11s deployed at the time of the 1972 SALT agreement was 970; 66 new silos were under construction.

SS-11 sites are suitable for adaptation to cold-launch techniques in which missiles of greater diameter, stored in cylindrical containers, can be accommodated in the same silo. A missile of SS-11 proportions made its debût during the Moscow parade in November 1973 within a trailer-mounted canister (67 ft long × 9 ft diameter) towed by a fully-enclosed transport vehicle.

Although the missile itself was hidden, the end of the canister had four orifices for thrust chambers and it was assumed that the encapsulated missile could be raised vertically from its trailer for lowering into a silo.

The launch system follows the practice adopted for expelling missiles from submerged submarines. Compressed-air or gas from a generator expels the missile from its casing for ignition above ground. The new silos can be smaller and less complex because there is no longer need to have a large space between the missile and the silo wall to cater for the blast effects of hot exhaust gases, and large underground exhaust ducts can be eliminated. There is the added advantage of a modest increase in performance, acoustic damage to the silo is eliminated and there are new opportunities for hardening the site against thermo-nuclear attack.

SS-13 Savage

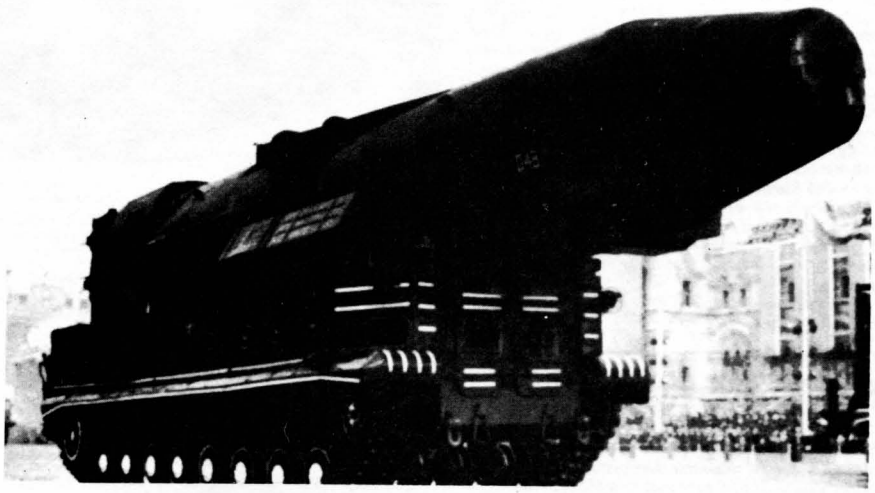
First seen in Red Square in May 1965, Savage compares with the US silo-based Minuteman 1 but has not been widely deployed. It appears to have been developed in parallel with the liquid-propellant SS-11 Sego which has superior performance and warhead capacity. A total of 60 SS-13s are in service with the Strategic Rocket Forces at Plesetsk, but these are likely to be superseded by the SS-16, which embodies the latest advances in solid-propellants, silo construction, missile guidance and warhead technology.

The missile itself – like the SS-10 Scrag – is characterised by interstage trusses which separate the stages.

SS-14 Scapegoat

This missile consists of two upper stages of the SS-13. Operationally, it is enclosed in the 'Iron Maiden' container carried on a modified JS III tank chassis. The complete system is known by the NATO code Scamp. Soviet commanders have been particularly enthusiastic for this mobile type of IRBM since it can be operated along the entire frontier of Soviet territory, from the Baltic to the Pacific. It also offers the advantage of operation from concealed positions in difficult terrain such as heavily wooded areas in the European USSR and mountain passes in areas adjoining the People's Republic of China.

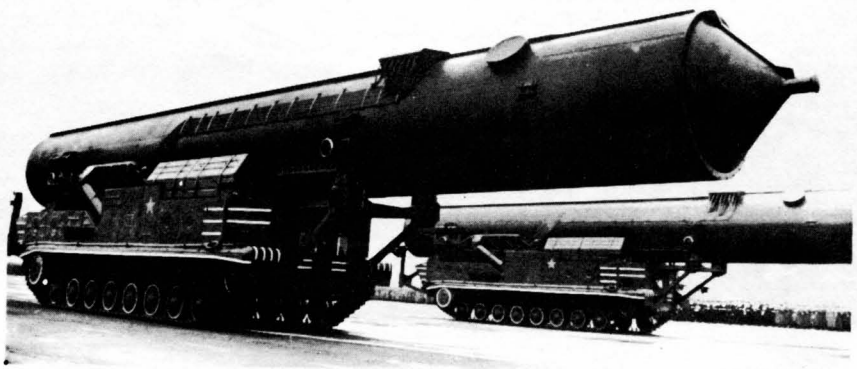
For operation the missile is elevated hydraulically by the transporter to stand erect on a small launch table at the rear of the vehicle; the covers are opened and moved aside. After target coordinates have been fed into the guidance system, Scapegoat is ready to fire.



SS-15 Scrooge

Employs a tracked transporter-erector of the type used by the SS-14 but the missile has greater performance. The 19 m (62 ft) tubular launcher is elevated for firing but does not hinge open as does the 'Iron Maiden' and it is assumed that launching is made directly from the tube.

Scrooge launchers have been identified close to the frontier with Red China near Buir Nor in Outer Mongolia. The whole of the United Kingdom and most of the Mediterranean area fall within range of Scrooge and Scamp-type launchers deployed in Eastern Europe and Western parts of the USSR. Improved weapons of this type are anticipated. (See SS-20 entry).



SS-16

The SS-16 is part of the family of new-generation strategic ballistic weapons which embody the latest propulsion, guidance and warhead technology. Pentagon sources describe the three-stage solid-propellant missile as slightly smaller than the SS-13 Savage but with about twice the throw-weight for a given range. This implies improvements in propulsion and/or warhead 'throw yield' which may be reflected later in other weapons systems, e.g. medium-range mobile missiles.

In common with other new ICBMs tested in the first half of the 1970s, SS-16 embodies a computer-controlled post-boost vehicle capable of directing MIRV warheads sequentially along the approach path onto different targets.

SS-16 is capable of being deployed in fixed and mobile launchers.

SS-17

A replacement for the SS-11 Sego. Giving details of three new Soviet ICBMs in 1973, Admiral Thomas H. Moorer, chairman of the Joint Chiefs of Staff, said apparent goals included the desire for better pre-launch survivability, accuracy and re-entry systems. "The Soviet Union", he said, "undoubtedly regards the achievement of a MIRV capability as an important political, as well as a military, goal."

Tests of the SS-17 were carried out during 1972, including two shots into the Pacific in November. The early trials indicated a multiple re-entry vehicle (MRV) package with three warheads. The weapon was judged to be more accurate than the SS-11 with three to four times the throw weight.

The SS-17 has since been described as suitable for use against point targets, the post-boost 'bus' dispensing MIRVs shaped for high-speed penetration of the atmosphere to ensure high accuracy.

It has also been stated that the missile employs the 'cold launch' technique being ejected from its launch silo by gas generator or compressed air before engine ignition above ground (see SS-11 entry).

SS-18

The world's biggest military rocket and the SS-9 replacement. It employs high-energy storable propellants and is cold-launched from a new type of silo. (There have been reports that existing SS-9 silos will be modified to accept it).

This formidable ICBM has every indication of being a first strike weapon. Pentagon sources suggest the throw-weight is 30 per cent greater than the SS-9. Flight trials have involved two versions and others (which may include satellite applications) are expected.

Mod 1 has a single re-entry vehicle which suggests high accuracy against hard targets.

Mod 2 carries up to eight MIRVs and (if necessary) associated decoys. A range of different warheads is anticipated to match the requirements of hard and soft targets. For example, some warheads may be mounted in pairs, one long and thin which arrives first and the other short and blunt which follows 1.5 to 2.0 minutes later with the heavier warhead.

The prime objective must be the saturation of Minuteman, Titan and other hardened or semi-hardened military bases with accurately directed high-yield thermonuclear bursts. Some warheads may be designed to disable silos and underground command posts by deeply-penetrating thermonuclear ground explosions causing severe seismic shocks. The post-boost computer (which triggers release of the MRV or MIRV heads) must make many thousands of calculations in the first 10 minutes of flight to compare flight errors with the pre-programmed target coordinates, and bring the manoeuvrable 'bus' onto precise course. An error of 1 ft/sec in cut-off velocity, for example, will result in a target miss of over a mile.

SS-19

In some ways comparable with the SS-17 but less advanced technically, this two-stage ICBM is also considered an SS-11 replacement. It can be cold-launched from existing silos.

As in the case of all new-generation Soviet ICBMs employing storable liquid propellants, the missile can be held at instant readiness for long periods. Precisely what liquids are used is difficult to assess but the Russians are known to have set up a large production plant for unsymmetrical dimethyl hydrazine (UDMH) which may be used in combination with the oxidizer nitrogen tetroxide (N_2O_4).

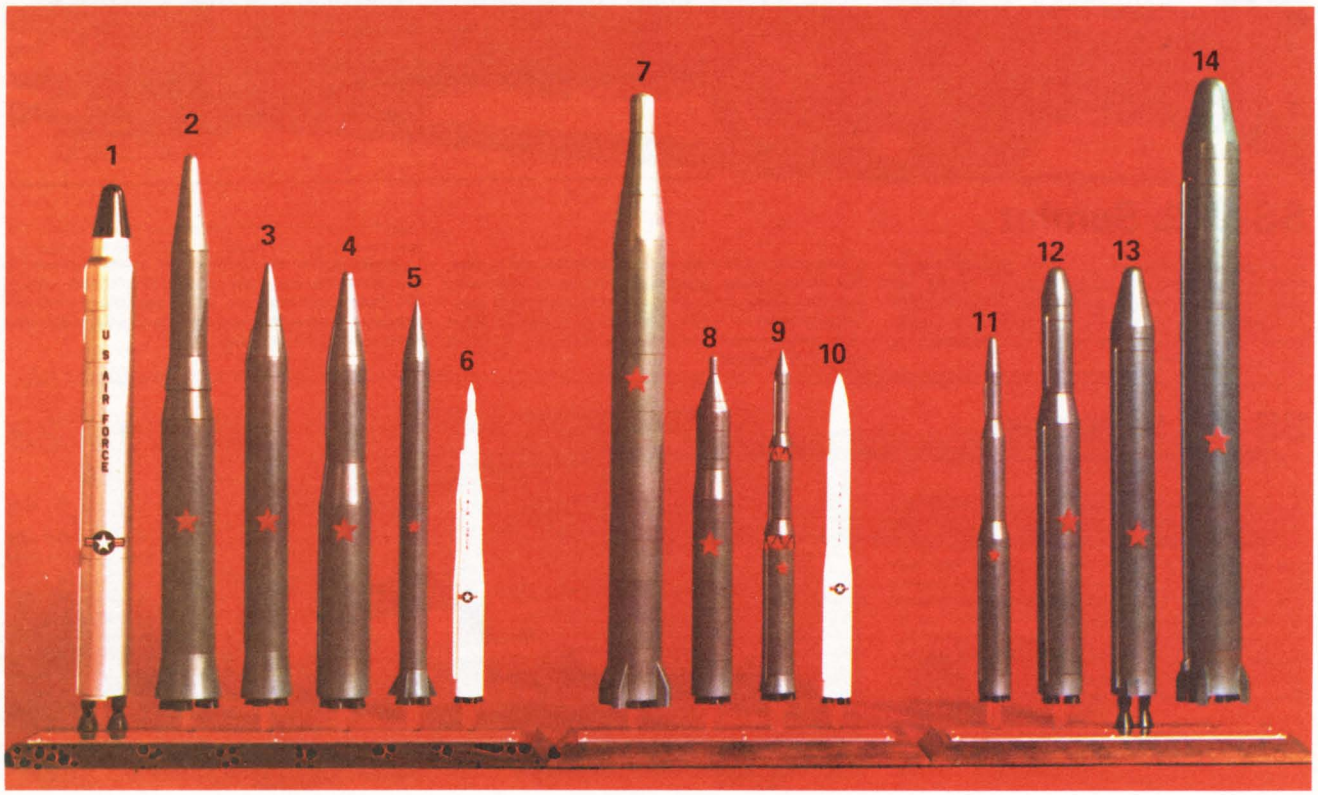
Over the past 15 years, the Soviets have made large efforts to improve the performance of rocket engines employing storable liquids and some of these improvements will undoubtedly be embodied in the SS-17, SS-18 and SS-19. Academician V.P. Glushko, the veteran rocket engine designer, refers to small-size engines of exceptionally high energy characteristics achieved by the use of *high combustion pressures* (running into hundreds of atmospheres*), a nearly complete combustion, the balanced and uniform discharge of combustion products, and nozzles of high expansion ratio. He also mentions improvements (embodied in the RD-253 mainstage engine of the large Proton space launcher, developed between 1961-65) in which the effort is made, in high pressure engines, to eliminate losses incurred in driving the turbopumps†.

Glushko writes: "Further increases in the specific impulse of the engines required an increase in the initial pressure inside the chamber, and this was limited by the losses incurred in driving the turbopumps. For developed engines with thrusts in the range of 11-116 tonnes these losses in specific impulse amounted to only 0.8 to 1.7 per cent with chamber pressures of 75-90 atmospheres but increased to an unacceptable extent with higher pressures. This problem was solved by developing a new liquid propellant engine in which the generator gas, after being used in the turbine, is burned in the main combustion chamber with the rest of the fuel. As a result losses caused by the turbopump drive are practically eliminated. In such engines, propellant components entering the chamber are mixed as gas and liquid and not as in more conventional designs as liquid-liquid."

*V. P. Glushko, "Development of Rocketry and Space Technology in the USSR", (USSR Academy of Sciences), Novosti Press Publishing House, Moscow, 1973.

†V. P. Glushko, "Rocket Engines GDL-OKB", (USSR Academy of Sciences), Novosti Press Publishing House, Moscow, 1975.

Table models of US/Soviet land-based ballistic missiles: 1. Titan II ICBM. 2. SS-7 ICBM. 3. SS-5 MRBM. 4. SS-8 ICBM. 5. SS-4 MRBM. 6. Minuteman II. 7. SS-9 ICBM. 8. SS-II ICBM. 9. SS-13 ICBM. 10. Minuteman III. 11. SS-16 ICBM. 12. SS-17 ICBM. 13. SS-19 ICBM. 14. SS-18 ICBM.



SS-20

Examples of this land-mobile missile, which employs the first two stages of the hot-launched SS-16, were said to be deployed on the Kamchatka Peninsula in the late spring of 1976. At the same time evidence of a new lightweight nuclear warhead of possibly 50 to 75 KT yield, 136 kg (300 lb) weight, led to range estimates being revised upwards from some 2,750 km (1,710 miles) – attainable with a 1.5 MT, 454 kg (1,000 lb) warhead to 5,700 to 7,400 km (3,540 to 4,600 miles).

A mini-ICBM, in a land-mobile role, which the SS-20 represents, poses a powerful new challenge over an immense area of Western strategic interest from the Indian Ocean to the Pacific and including India, China, Japan, Northern parts of Australia and even parts of the United States. It also represents a serious new threat to the entire area of NATO responsibility covering the whole of Western Europe and the Middle East from sites inside the USSR.

CRUISE OR WINGED MISSILES

SSC-1/SS-N-3 Shaddock

The Shaddock is a large cruise missile for coastal defence. When displayed in Red Square parades, it has been concealed in a vehicle which resembles a road tanker. In fact, the 15.7 m (51.5 ft) 'tank' contains a rail-mounted winged missile which must be at least 12 m (40 ft) long. With the container lid raised, it was possible to glimpse the nozzle of a turbojet (or ramjet) and two JATO units, one on each side of a ventral fin. The wings appear to be of the hinged 'flip out' type.

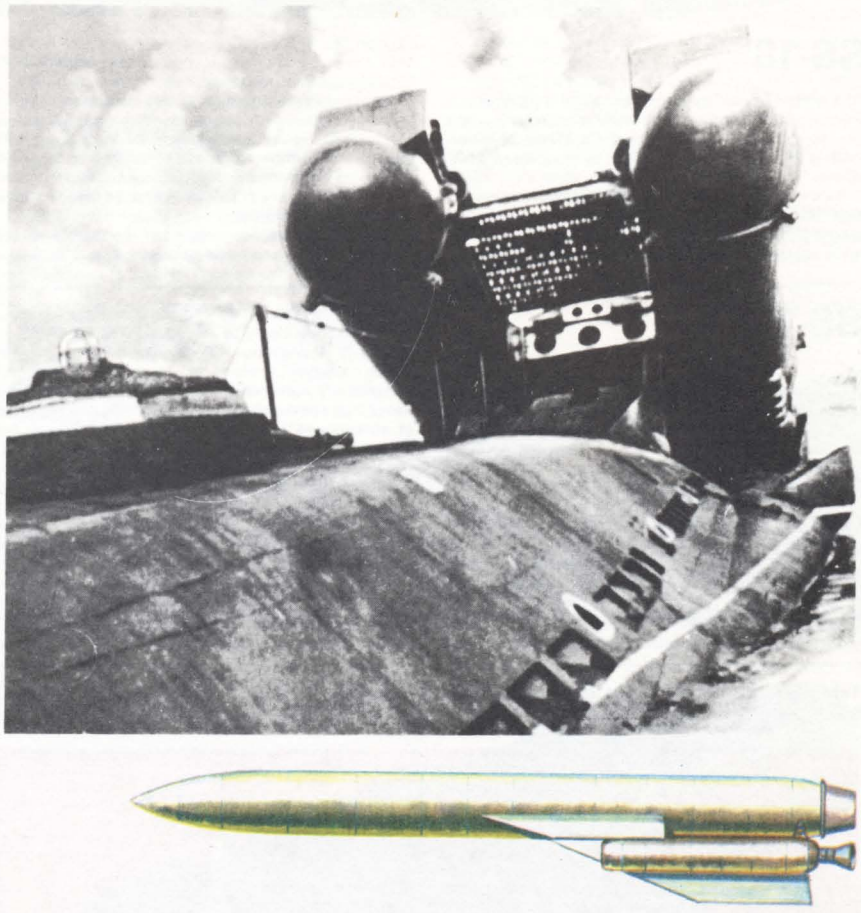
The Shaddock container elevates to an inclined launch position firing over the cab.

The **SS-N-3** variant has been deployed at sea aboard many surface ships and submarines. For example, Kresta-class cruisers have two pairs of launchers. Kynda-class cruisers have two rotatable quad launchers which elevate to 30°. Installations aboard diesel and nuclear-powered submarines have two to eight launch canisters. On E1 nuclear submarines, three pairs flush with the deck elevate for firing; the E2 class have four pairs.

When launched from surface ships, Shaddock operates in association with Scoop Pair tracking radar. Presumably, the missile is automatically gathered on the tracking radar centreline and then rides that beam to the target. However, missiles of this type can be fired far beyond the visible horizon and mid-course guidance may be applied via a cooperative aircraft or helicopter.

Shaddock can fly low or high trajectories and approaches its target in a terminal dive.

Coastal belts of the United States are vulnerable to Shaddock from nuclear submarines operating off the coast. Improved versions of this class of weapon are being introduced (see SS-NX-12 entry in table).



Early SS-N-3 installation in Whisky Twin-Cylinder submarine, elevated to firing position

SS-C-2b Samlet

A cruise missile adapted from the obsolete Kennel air-to-surface missile for coastal defence, Samlet has replaced the older 130 mm coastal gun. After arriving at its appointed coastal site on a single-axle semi-trailer towed by a ZIL-157V tractor truck, it is transferred to a large rail-type launcher.

Launching is assisted by an undertail JATO unit. The cruise missile operates in association with van-mounted Sheet Bend missile control radar and long-range surveillance radars. Like Kennel, it has an active radar seeker mounted in a radome above the split-duct intake of the turbojet.

Samlet is reported to have been widely deployed by the Soviet Navy at stations ranging from the Baltic to the Pacific including the Black Sea area. It has also appeared in other Warsaw Pact countries and has been exported to Cuba and Egypt.

SS-N-1 Scrubber

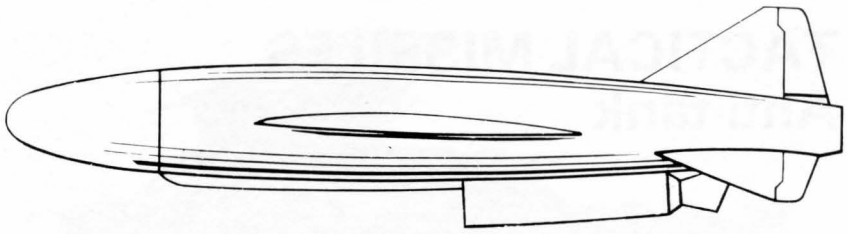
A sea-going cruise missile larger than Styx, the SS-N-1 is fired from a 'hanger'-type launcher on a 17 m (23 ft) rail. The whole assembly rotates through about 250° and elevates to the appropriate launch angle. Two such launchers were installed fore and aft on certain Krupny-class destroyers. Kildin-class destroyers have a single launcher mounted near the stern.

Launched with the help of an undertail JATO unit, the winged missile has a turbojet sustainer and operates in conjunction with ships' radar. An infra-red homing head serves for terminal guidance. Maximum range is about 240 km (149 miles).

Scrubber is being superseded by the SS-N-11.

The SS-N-1 is described in some reports as Strela but this is not the current NATO code name.

SS-N-2a Styx



This missile is carried by Komar and Osa-class fast patrol boats. The weapon achieved notoriety on 21 October 1967 when missile boats of the Egyptian Navy sank the Israeli destroyer *Eilat* from the security of Port Said harbour. Since that time Styx has seen action in the Indo-Pakistan war of December 1971 (in the hands of the Indian Navy), and was fired by Egyptian and Syrian boats in the October War.

Styx has the appearance of a small pilotless aircraft with a slightly bulbous fuselage supporting cropped delta wings. Autopilot/command guidance control is applied through ailerons and control surfaces on each of three tail fins. The missile is capable of homing on radio frequency energy emitted by ships' defensive radar.

Extensive use is made of Styx by Soviet bloc navies. Komar and Osa-class FPBs carry two and four respectively in waterproof launch canisters mounted on the after deck. Launching is assisted by an undertail JATO unit.

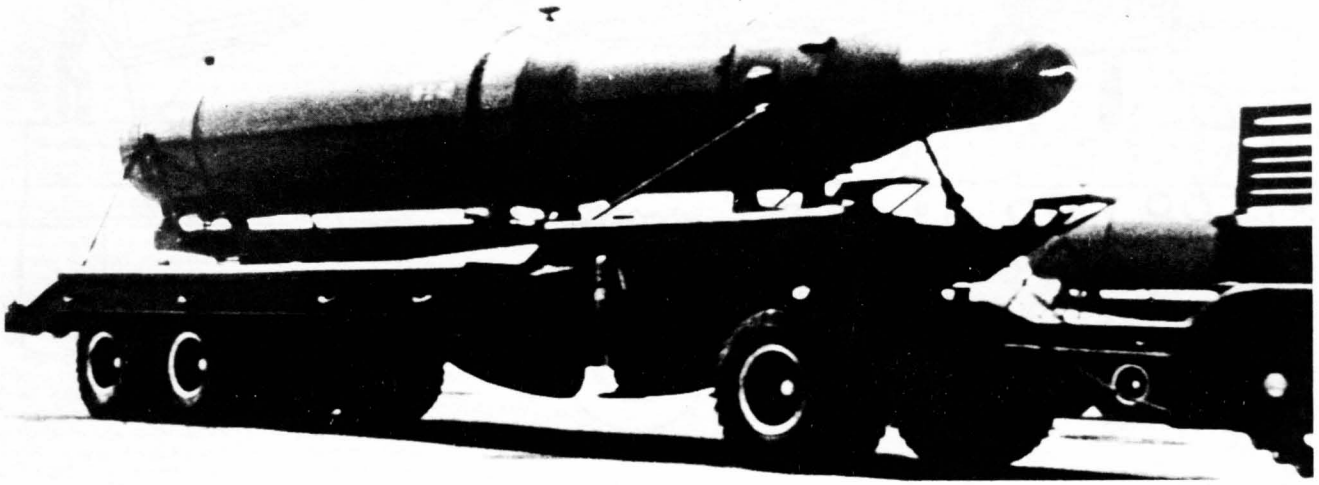
The SS-N-2b variant is reported to have additional IR homing capability.

SUBMARINE-LAUNCHED BALLISTIC MISSILES

SS-N-4 Sark

This huge two-stage solid-propellant missile was carried by early Golf and Hotel class submarines and was first deployed in 1961. It could be launched only when the submarine had surfaced. To accommodated the 15 m (49 ft) Sark, launch tubes projected up through the pressure hull and bridge fin. The weapon was first displayed in a Moscow military parade in November 1962. Guidance was inertial, maximum range being about 580 km (350 miles).

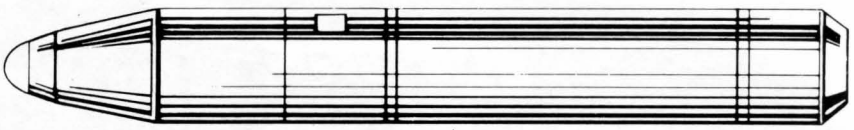
SS-N-5 Serb



The Serb has been deployed in Golf III and Hotel II class submarines which have three launch tubes in an extended fin. The 10 m (33 ft) long solid-propellant missile entered service in 1964 and first appeared in a Red Square parade in November 1964. At the base were 18 electrically-operated nozzles of a gas-generator by which Serb is expelled from the submarine's launch tube. It is assumed that the unit separates explosively shortly before main stage ignition in mid-air. Estimated range is about 1,210 km (750 miles).

Editor's note: Since the above was written, it has become increasingly probable that the propellant for SS-N-5 Serb and SS-N-6 Sawfly (below) is storable liquid and not solid.

SS-N-6 Sawfly



A much improved SLBM of greater performance, Sawfly made its debut in a Red Square parade in November 1967. It could be accommodated in vertical launch tubes within the hull of a submarine in the same way as the U.S. Navy's Polaris. In 1969 the Pentagon estimated that some 50 submarines had been built to carry ballistic missiles, half of them nuclear powered. Fifteen Y-class vessels were under construction at Severodvinsk, near Archangel, and at another smaller yard. Each was designed to carry 16 two-stage missiles of the Sawfly family.

There were three versions of SS-N-6. Mod 1 with limited range; Mod 2 having longer range with single re-entry vehicle, and Mod 3 with longer range than either of the above with multiple re-entry vehicles.

At the same time there were reports of a new Soviet submarine of longer range and capability which had already entered the test stage. This Delta-class boat has since emerged as a formidable missile platform capable of striking at important United States targets without straying deeply from home stations. It accommodates 12 of the new-generation SS-N-8 missiles which have improved propulsion and steller-inertial guidance conferring high accuracy (CEP = 0.4 km (0.25 mile). Two missiles of this type were launched on test over distances of some 7,890 km (4,900 miles) between the Barents Sea and the central Pacific Ocean in October 1974. Two versions of the SS-N-8 have been identified. Mod 1 with a single re-entry vehicle, and Mod 2 with three MRVs or MIRVs.

An improved Delta submarine with 16 launch tubes put to sea in 1976 and a still larger boat carrying more missiles is under construction.

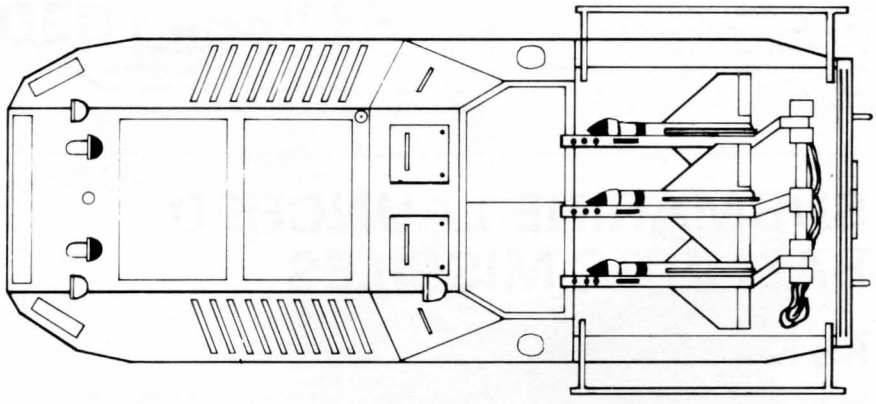
TACTICAL MISSILES
Anti-tank

AT-1 Snapper

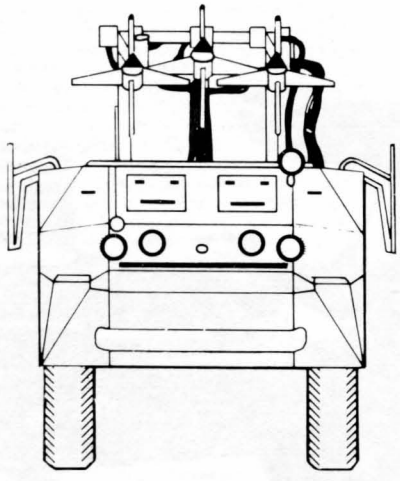
First-generation wire-guided anti-tank missile no longer in production. Operator sights his target through periscopic binoculars incorporating an illuminated variable-brightness reticle and steers by line-of-sight using joy-stick control assisted by tracking flares on two of the missile's cruciform wings. Control is applied by trailing-edge vibrating spoilers. Maximum range is about 2,000 m (6,560 ft).

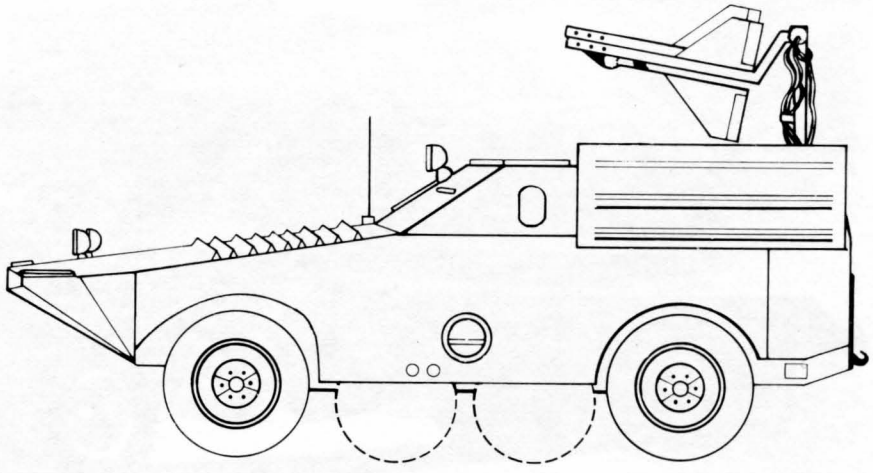
Remote firings are possible at distances up to about 50 m (165 ft) from the launcher. In the 1967 Arab-Israeli War, Gaz 69 vehicles had quad launchers. AT-1 was normally deployed by the Soviet Army on a triple launcher. The mounting device carried on BRDM vehicles was fully retractable, the missiles on their launchers being stored under hinged armour plates which opened when the mounting stems were raised. Missile control equipment was in the forward compartment of the vehicle.

The weapon is being replaced by the AT-3 Sagger.



Plan front and side elevations of BRDM with triple AT-1 launcher extended. The side view shows (broken lines) the extra rough-field wheels





AT-2 Swatter

Carried by BRDM vehicles on a quad launcher, this wire-guided missile, which has a range of some 2,500 m (8,200 ft), has elevons on the trailing edges of rear-mounted wings and movable foreplanes all worked together by the guidance system. Armour penetration exceeds 40 cm (15.8 in).

Examples of AT-2 are still in service in Warsaw Pact countries. On BRDMs the quad-launcher is fully retractable in the back of the vehicle, and missile control is in the forward compartment.

'B' version of Swatter has a second-generation auto guidance system.

AT-3 Sagger

This much improved wire-guided anti-tank missile can be operated by two-or three-man infantry teams including remote firing from a portable single-rail launcher up to 100 m (328 ft) from the carrier vehicle. Hits up to 1,000 m (3,280 ft) from a target are possible with the unaided eye and 3,000 m (9,840 ft) using a telescopic sight. The missile takes 12.5 seconds to travel 1,500 m (4,920 ft).

Sagger first appeared in a Moscow military parade in May 1965. It has cruciform wings which fold for stowage and transportation and is altogether more compact than earlier Soviet anti-tank missiles, although it preserves an effective warhead; armour penetration exceeds 40 cm (15.8 in).

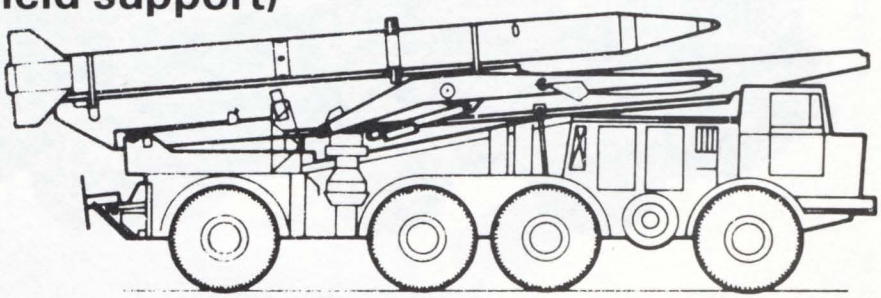
Carriers include the BMP-1 which has a single launch rail fitted above the guntube of the main armament and a total of four missiles; the BMD-1APC has one launcher, and the Polish Skot APC, two. Produced in large numbers, Sagger is in service with the Warsaw Pact countries and has seen action in Egypt and Syria. In the 1973 Arab-Israeli War, it was operated in ground-launched man-pack versions and from sextuple retractable launchers from BRDM-1 scout cars which are distinguished by a peak armoured roof which shelters the launchers even when they have been elevated into the firing position. Missiles can be fired singly or in salvoes.

Examples captured in Egypt were in "suitcase" packs for the use of infantrymen lying prone on the ground. One plastic case contained the separated warhead/booster and main propulsion and guidance system; the other the portable fire control box including joystick, firing button, power pack and optical periscopic sight. The missile launch rail was set up on hinged supports on the lid of a carrying case placed flat on the ground.

A new generation of Soviet anti-tank missiles is anticipated including those adapted for helicopter use. Stub-wing launchers appear on the Mi-24 Hind-A assault helicopter.

Short-range (battlefield support)

Frog



Frog 7 on ZIL-135 erector-launcher

The acronym of 'Free Rocket Over Ground' refers to a family of unguided, spin stabilised, artillery rocket in service with the Soviet Army on transporter-launchers. All versions employ solid-propellants with conventional main nozzles and secondary annular nozzles. Armed with nuclear, chemical or conventional HE warheads, the Frogs are intended to lay down a devastating blanket fire on battlefield and rear-area deployments of troops and armour. Frog 1, a single-stage, four-finned rocket entered service about 1957. Mounted on a tracked launch vehicle, it was cradled by a split-length casing with its heavy bulbous warhead protected by a forward framework. The estimated range was 20 km (32 miles). Frog 2, deployed the same year, was about the same length but smaller in diameter. The maximum range was about 12 km (7.5 miles).

Frogs 3 and 4, which have two tandem rocket motors, also spin stabilised and un-guided, are launched from a modified PT-76 tank chassis. Photographs of Frog 3 in action show that a forward ring of thrusters fires at the same time as the 'first stage' motor as the rocket leaves the ramp. Frogs 3 and 4 differ mainly in the shape and capacity of warheads. They have ranges of up to 45 km (28 miles) and 50 km (31 miles) respectively.

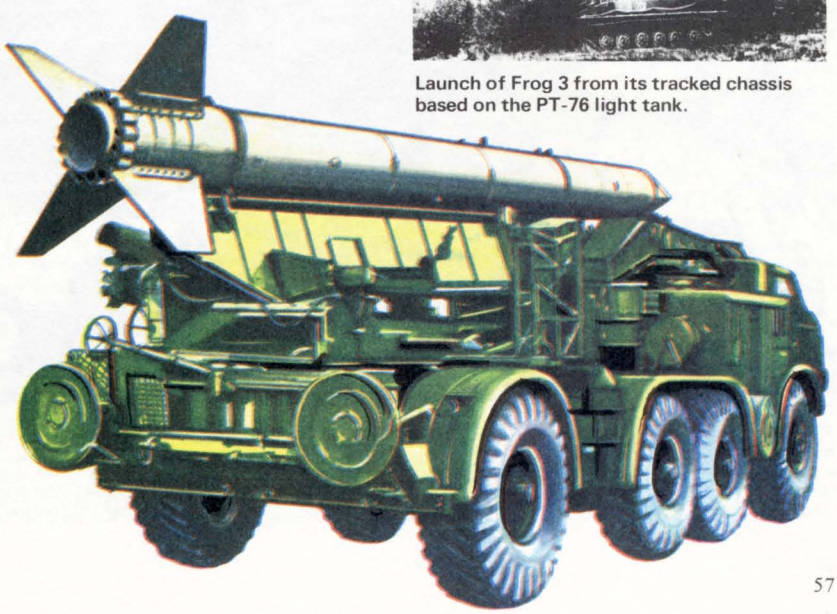
Three more variants, Frogs 5, 6 and 7, were introduced later. Frog 6 has been identified as a dummy used for training purposes. Frog 7 – a much improved weapon – employs a new erector-launch vehicle designated ZIL 135 which incorporates an onboard crane for swift re-loading. A similar vehicle is used to transport reserve rockets. (Early FROGS needed semi-trailers towed by ZIL 157V tractor trucks, and crane trucks were required to reload the transport-launch vehicles). Warheads are brought up in sealed canisters on separate trailers, the nuclear variety being under Soviet custody.

Although Frog 7 reverts to a more conventional single-stage arrangement, the four-finned rocket embodies many improvements including (it is believed) improved propellants. The warhead nosecone is streamlined with the motor casing. Estimates suggest that a 450 kg (1,000 lb) warhead could be launched over a distance of some 56 km (35 miles) with range adjustment by means of speed brakes.

Apart from countries of the Warsaw Pact, Frog 7 launchers have been supplied to Egypt and Syria. Examples were fired by the Syrian Army in the 1973 October War with Israel. Reports have mentioned a guided version.

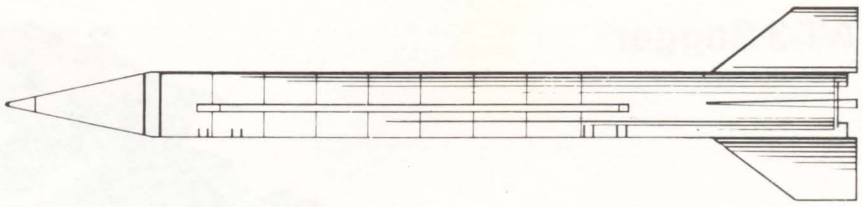
Future developments of the Frog/Scud families could include scatter type warheads or unpowered guided projectiles which seek out active radars associated with enemy air defences including surface-to-air missile sites and/or infra-red emissions associated with tanks and other vehicles.

Launch of Frog 3 from its tracked chassis based on the PT-76 light tank.



Medium range

SS-1B Scud A

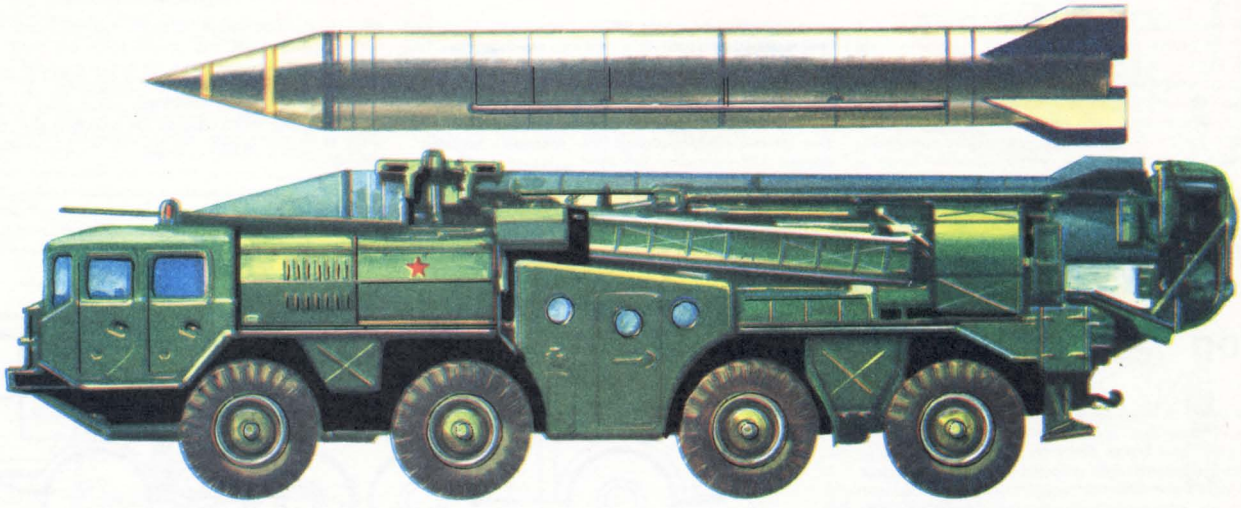


This a battlefield support weapon is designed to strike at targets such as marshalling areas, major storage dumps and airfields behind enemy lines. Warheads can be either nuclear, chemical (persistent) or conventional high explosive.

The missile, which employs storable liquid propellants, is carried on a JS-III tracked vehicle which raises it by hydraulic jacks into a vertical position for launching from a small platform. Elevating with Scud A on its erector is a ladder framework which gives the launch crew access to the full length of the missile on its platform. Missiles of the Scud family have simplified inertial guidance; an accelerometer senses that a pre-set velocity has been reached and terminates thrust. Maximum range is about 180 km (112 miles).

Crews are trained to operate from points of maximum concealment, e.g. heavily forested areas, to avoid detection. After a missile is fired the transporter is immediately driven to a new location to avoid a counter-strike and the vehicle is reloaded from a support vehicle.

SS-1C Scud B

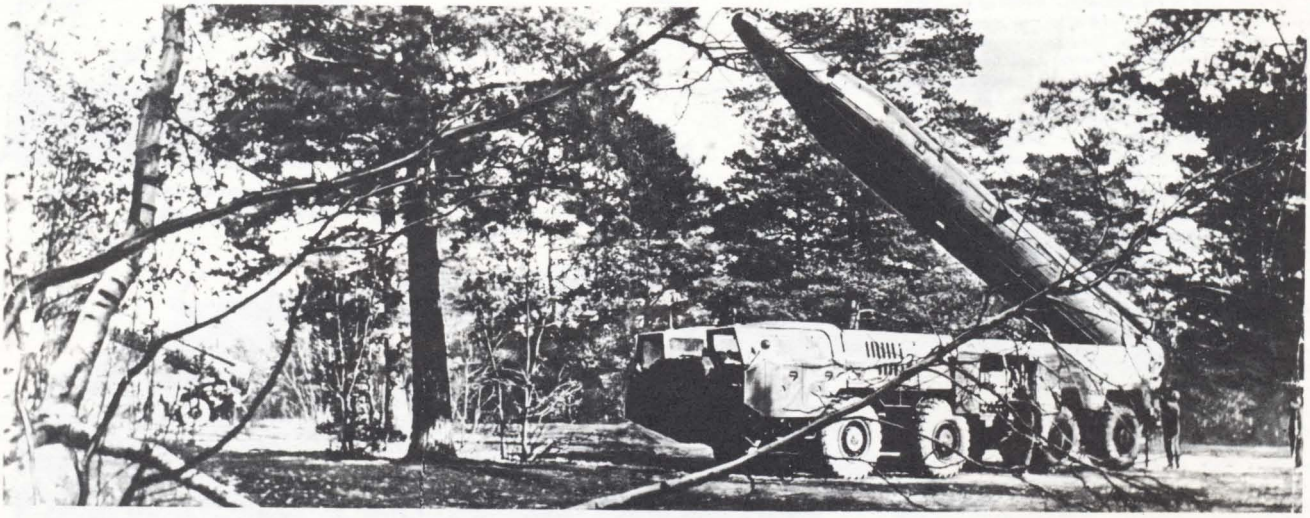


A larger member of the family, Scud B may have a range of 280 km (174 miles). It is carried in one of the most modern air conditioned, heated, cross-country wheeled vehicles. The introduction of this powerful vehicle, a modified MAZ-543, gives the weapon system greater road mobility, reduces the number of support vehicles required, and offers a wide choice in selecting offroad firing positions. Scud missiles are used by all armies of the Warsaw Pact but nuclear warheads for them are in Soviet hands.

The missile itself is concealed within a ribbed split protective casing which elevates with the erector. As before, launching is made vertically from a small platform. The warhead can be either nuclear or conventional HE.

Of three Scuds fired by Egyptian forces in Sinai during the 1973 October War, all were reported to have missed their targets. A Scud is said to have been test fired by the Syrian Army over a distance of some 250 km (155 miles) in November 1975.

SS-12 Scaleboard



A derivitive of the Scud family, the SS-12 first appeared in a Moscow military parade in November 1967. Although it employs the same MAZ 543 type transporter-erector as Scud B, the missile is larger and has much greater range — perhaps 700 to 800 km (435 to 497 miles) — which brings south-eastern England within range from forward areas of East Germany.

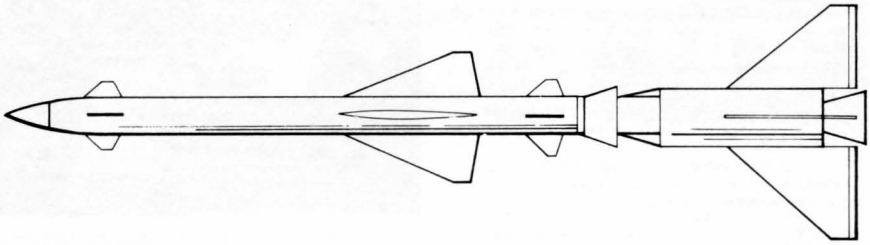
Scaleboard, like Scud B, has a ribbed split casing which encloses it completely and elevates with it into firing position. Good sightings of the MAZ 543 transporter show that the missile launch operator has a control console in the right hand cab (the driver being in the left hand cab). Other members of the launch crew occupy seats at the back of the cabs. The photograph shows two missiles being elevated.

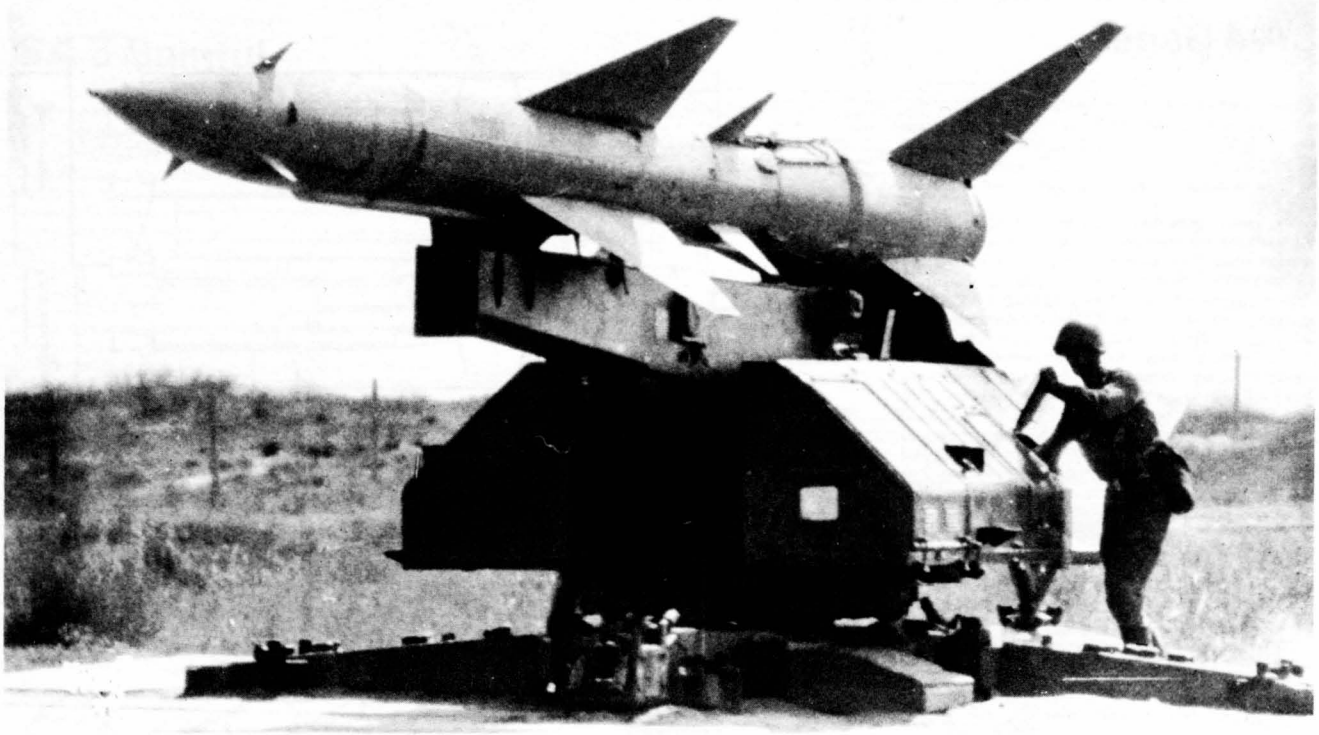
SURFACE-TO-AIR MISSILES

SA-1 Guild

First seen in a Moscow military parade in November 1960. Not widely deployed, although large numbers were built for test and training purposes. The missile took the form of a canard with all-moving cruciform foreplanes and a small aileron on each cruciform wing. There was no separate booster and it is assumed that the motor was a dual-thrust solid.

SA-2 Guideline





This medium-to-high-altitude anti-aircraft missile is widely deployed in the USSR and other Warsaw Pact countries and has been in action in South-East Asia and the Middle East. It was first publicly displayed in 1957. An early version is said to have brought down the U-2 aircraft flown by Lt. Francis Gary Powers during his overflight of the Soviet Union on May Day 1960.

The weapon system has since undergone considerable refinement and today appears in different versions. Examples deployed in Egypt, including power supplies and guidance radar, were identified as the V75SM. The missile, designated V750VK, is transported on a cross-country semi-trailer and operates from a rotatable launcher. The four-finned booster burns for 4-5 seconds, two of the booster fins having gyro-controlled rudders for initial course-setting. The SA-2 sustainer, which burns for about 22 seconds, is fuelled by nitric acid and a liquid hydrocarbon (probably kerosene). It has cruciform delta wings and steerable fins. Four small canard surfaces are mounted just aft of the nosecone.

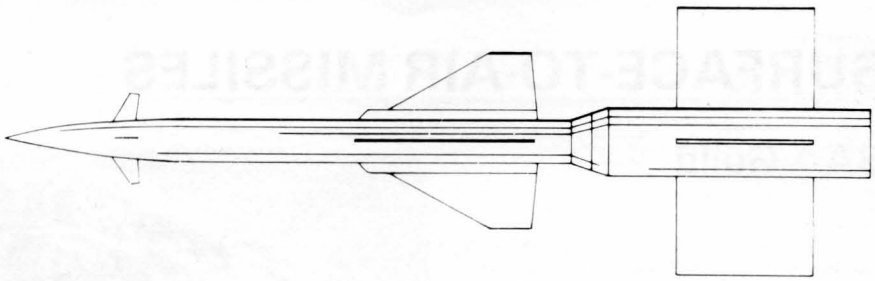
At one time it is thought that some 4,500 SA-2s were operational in the USSR. In Egypt and Syria they were operated on ZIL 157 transporter/launchers in conjunction with SA-3 and SA-6 to obtain a comprehensive all-altitude defence system (photo, pages 54-55).

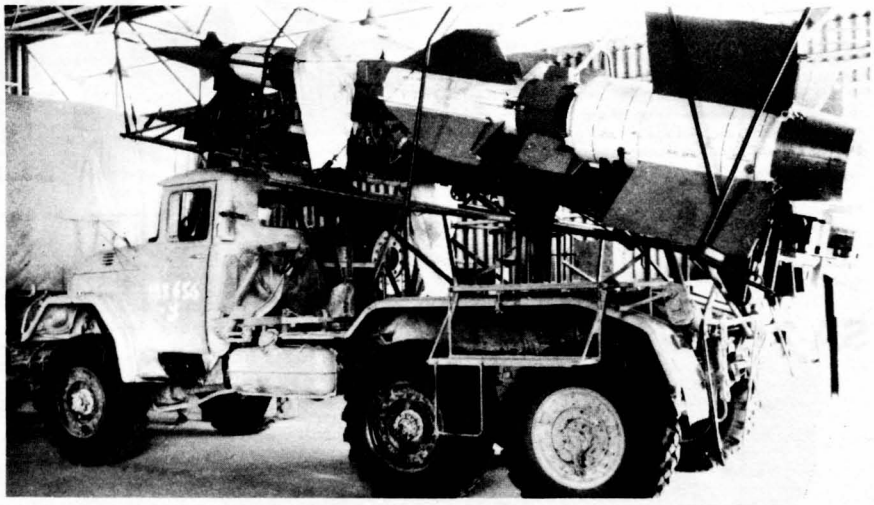
Guidance of the standard missile depends on a van-mounted Fan Song A/B (E/F band) or D/E (G-band) radar which acquires the target and feeds target data to a computer. Steering commands generated by the computer are transmitted to the missile over a UHF link vectoring it into the radar beam to intercept the target.

A modified version of SA-2 appeared in a Moscow military parade in 1967. Slightly longer than the original, it had an enlarged warhead and dispensed with the usual small canard surfaces.

The naval version of Guideline – SA-N-2 – has not been widely deployed, probably because of difficulties in applying the associated guidance radar to ships. A twin-launcher replaces a gun turret on the cruiser *Dzerzhinski*, operating in conjunction with a C-band Fan Song radar.

SA-3 Goa





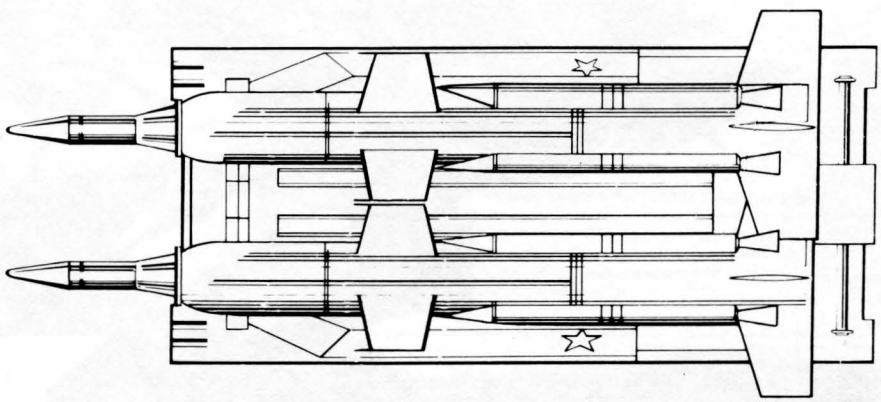
Goa is the mobile low-altitude counterpart of SA-2 and like that weapon, has been widely deployed in the USSR/Warsaw Pact countries, South-East Asia and the Middle East. Its American equivalent is the MIM-23A Hawk. The SA-3, which has a canard configuration, has cruciform delta wings and steerable foreplanes. The boost and sustainer motors are both solid-fuelled.

Early systems were mounted on ZIL 157 tractors, others employ tracked vehicles. As in the case of SA-2, considerable information on SA-3 has been derived from captured weapons.

Guidance is by automatic radio command, targets being acquired by a truck-mounted UHF (810-850 MHz and 880-950 MHz) P-15 Flat Face radar with dual parabolic antennae. Low Blow fire control radar operates in the I-band (9,000-9,400 MHz) on the principle of Fan Song (see SA-2). Up to six aircraft can be tracked simultaneously and one or two missiles can be fired at the same target.

The original version of Goa – the SA-N-1 – is widely deployed on ships of the Soviet Navy. It operates in association with Peel Group radar.

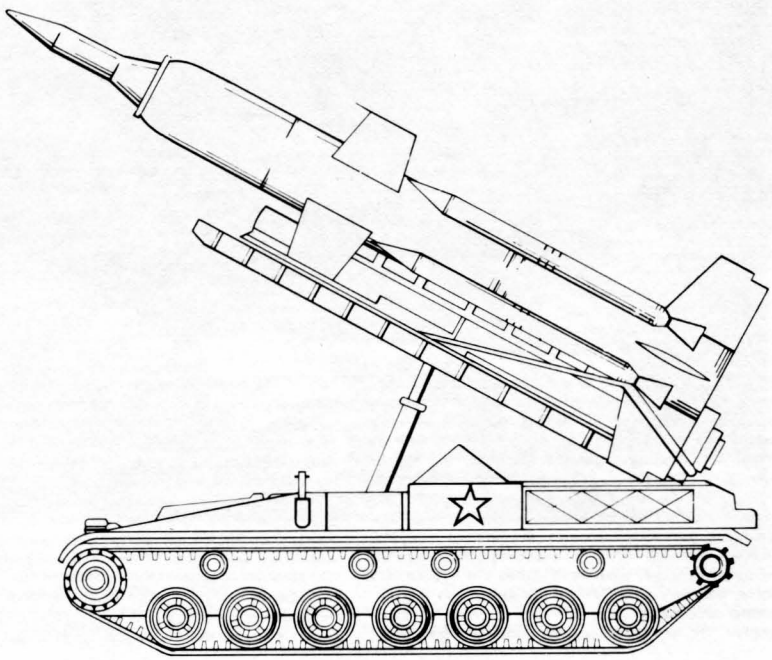
SA-4 Ganef



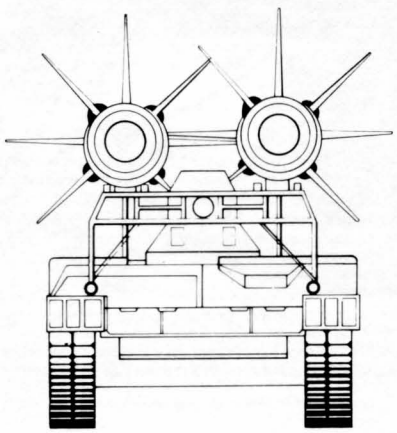
A medium-altitude air-defence weapon, the SA-4 is propelled by an integral ramjet which confers long range. It was first displayed in Moscow in 1964 on a twin-round tracked vehicle and two complete weapons systems can be air-lifted to battlefield deployments in the An-22 military freighter.

The ramjet body has a diameter of about 80 cm (31.5 in) with the centrebody projecting forward from an annular intake. Four fixed tail fins are indexed at 45° to the wings which are all-moving for control.

Ganef operates in conjunction with Long Track E-band scanning radar and Pat Hand H-band target acquisition and fire control radar. Its purpose is to provide combat troops operating in forward areas with umbrella protection against air strikes. When deployed with the Soviet Army nine SA-4 batteries comprising three twin-launchers, one loading vehicle and one Pat Hand radar, are interspersed between SA-6 batteries. The air-defence group moves up with the Army advance, the first three batteries deploying some 10 km (6.2 miles) to the rear of forward positions with the other batteries moving up in a belt some 15 km (9.3 miles) behind.



SA-4 missiles are carried on a specially designed launcher not derived from an existing AFV (photo, page 56)



SA-5 Gammon

This long-range, high-altitude, air defence weapon was first seen in a Moscow parade in 1963. The missile system, which has replaced many SA-2 sites within the USSR, operates in conjunction with Square Pair radar and may have limited anti-missile capability.

An improved version of the SA-5 air defence missile radar was reportedly under test at Sary Sagan in the early 1970s. The effective ceiling for intercept may now exceed 30,500 m (100,000 ft) and it is possible that some examples of SA-5 have a nuclear warhead intended to immobilise US and/or Chinese ICBM warheads by high energy neutron fluxes.

The boost and sustainer motors are both solid-fuelled. The sustainer has four cropped delta wings and steerable rear fins. Control is assisted by ailerons, and the missile responds to semi-active radar homing. An effective anti-missile capability would require a manoeuvrable warhead 'bus' which separates after second stage burn-out. Reports suggest that the uprated system operates in association with a new mobile phased-array ABM radar.

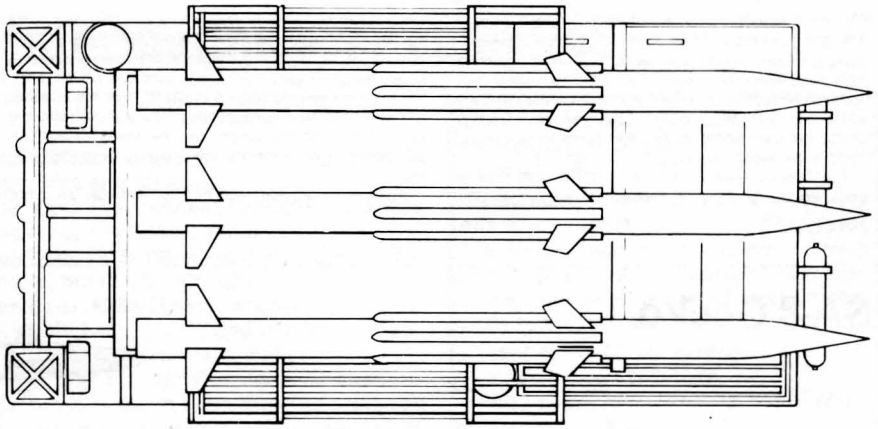
SA-5 is described in some reports as Griffon, but this is not the NATO code name.

SA-6 Gainful

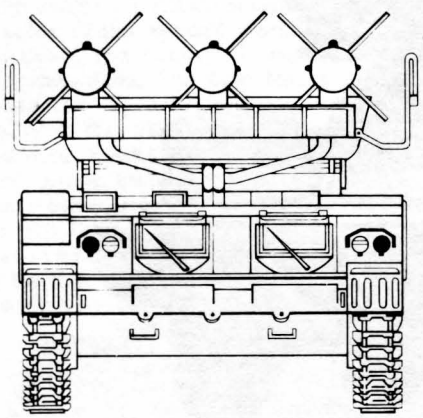
This mobile battlefield air-defence weapon was seen to be effective against low-flying Israeli strike aircraft in the 1973 October War, often in the face of ECM. The propulsion unit is unique. After the boost phase, the combustion chamber of the solid propellant rocket motor becomes a ramjet when ram air is mixed with exhaust from a solid fuel gas generator. Components, from nosecone to tail, are (a) guidance and control unit, (b) warhead, (c) solid-propellant motor, (d) ram inlets in four external ducts between cruciform wings, (e) combined rocket/ramjet combustion chamber, (f) steerable fins and (g) exhaust nozzle.

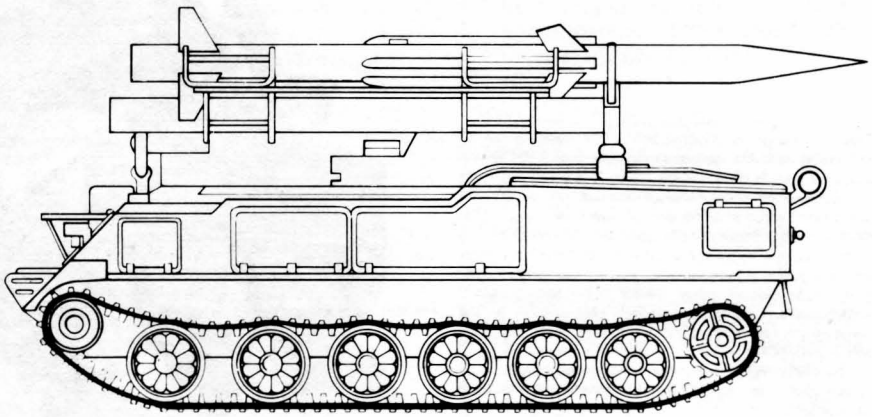
Mounted on a triple launcher on a modified PT-76 tank chassis, a missile group consists of three triple launchers, one loading vehicle and one Straight Flush radar, also PT-76 mounted. After Long Track radars have acquired a target, fire control is taken over by Straight Flush missile site radars. Target tracking is by a 1-deg H-band (7.7-8 GHz) pencil beam and mid-course guidance commands are transmitted to the missile in I-band (8.5-9 GHz). Final intercept is by semi-active radar homing using continuous wave (CW) radar to which in 1973 the West had no ECM answer.

Gainful has been supplied to Egypt, Syria, Libya and North Vietnam.



The launch vehicle normally carries its missiles pointing to the rear (photo, page 44)





SA-7 Grail

Grail is the Russian equivalent of the US Army's Redeye. It is tube mounted and fired from the shoulder. The heat-seeking missile, which saw service in Vietnam and the 1973 Arab-Israeli War, was often effective against helicopters and low-flying aircraft despite counter-measures which included use of decoy flares and deflected helicopter exhaust. Some models had filters to screen out flares in the responsive part of the IR spectrum.

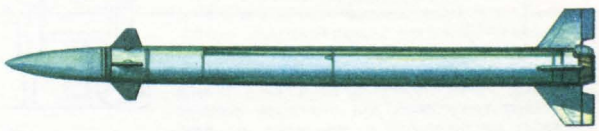
The Grail operator tracks the hostile aircraft through open sights. A red light appears in the optical sight when the IR seeker is energised, changing to green when the device has locked on. This is the signal for the operator to squeeze the trigger of the pistol grip. The boost motor propels the missile from the plastic tube, the sustainer igniting some 6 m (20 ft) from the operator to protect him from exhaust blast. The seeker senses the exhaust heat of the target and the guidance system, acting on cruciform canard vanes, steers the missile into the target.

Apart from shoulder-launched applications, SA-7 has been mounted on vehicles in batteries of four, six and eight and a radar-aiming system has been introduced. In the October War Egyptian forces fired salvoes at individual low-flying Israeli aircraft, although few 'kills' were reported, the main damage being to jetpipes.

The weapon is now finding its way into the hands of terrorist and guerilla organisations.

In some reports, SA-7 is referred to as Strela (Arrow) but this is not the NATO code name.

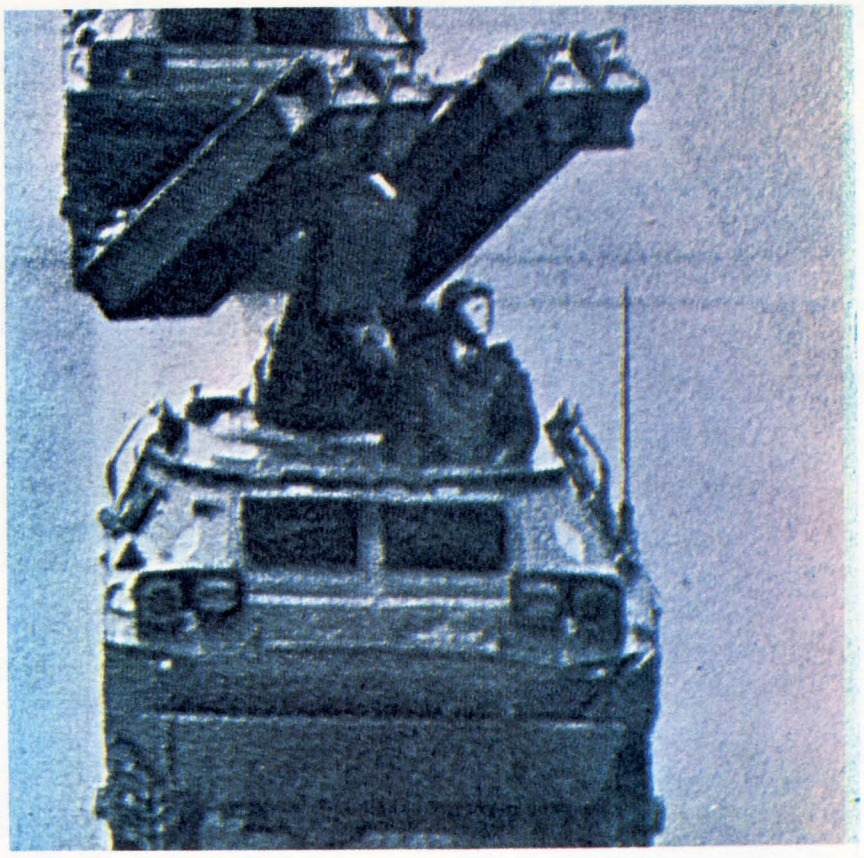
SA-8 Gecko



This short-range, all weather anti-aircraft weapon can be compared with the European Roland. First seen in the Moscow parade of November 1975, it is turret-mounted on a six-wheeled amphibious vehicle on which the surveillance radar antenna (folded down for transport) is flanked by quadruple missile launchers. Mounted on the same rotatable turret are acquisition and tracking radar and two guidance radars which operate in conjunction with a low-light electro-optical tracker. The two guidance radars make it possible to launch two missiles at the same target, each one responding to a different frequency to frustrate ECM.

The entire weapon system is air-transportable. The missile itself has canard steerable foreplanes and fixed tail surfaces.

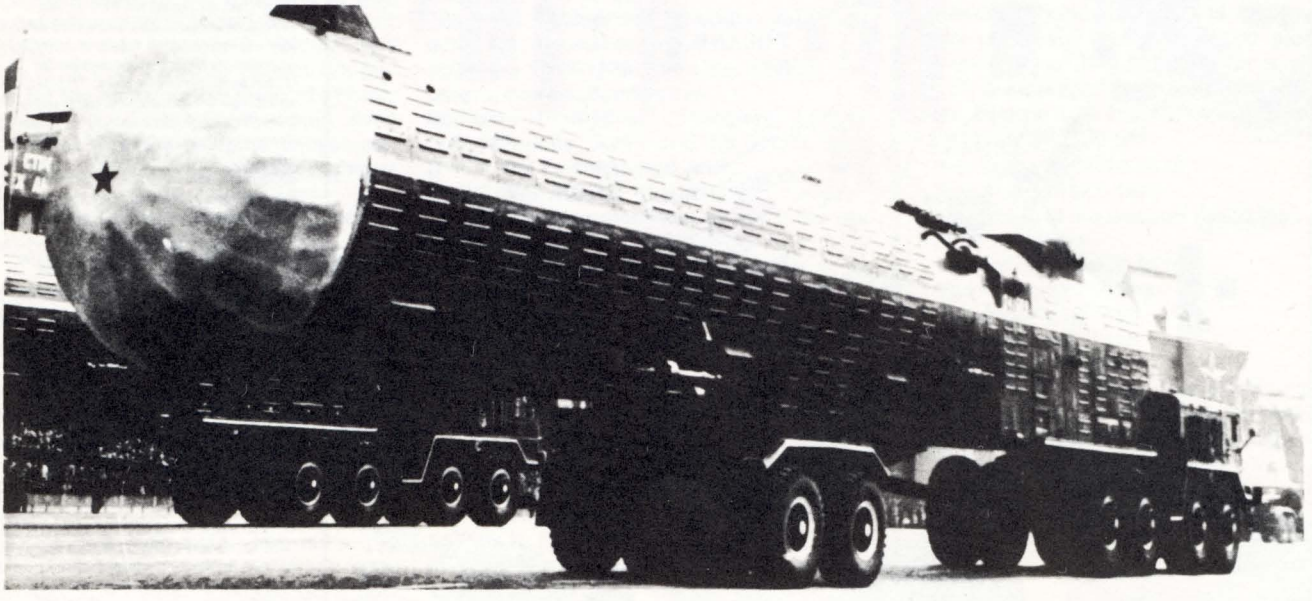
SA-9 Gaskin



Gaskin is part of a battlefield low-altitude air defence system. Installed in twin-quad box launchers on the amphibious BRDM scout car, it first appeared in the Moscow parade of November 1975. Although the missile may use the same type of IR seeker as the SA-7, it has a larger rocket motor and warhead and the canard control surfaces are non-folding. Targets appear to be optically acquired by an operator seated in the vehicle cabin, having been alerted to an approaching target by a surveillance data link. The quad launcher is fully retractable. When not in use the missile boxes rotate aft and down to rest on the rear part of the vehicle with side grilles raised for protection.

ANTI-BALLISTIC MISSILES

ABM-1 Galosh

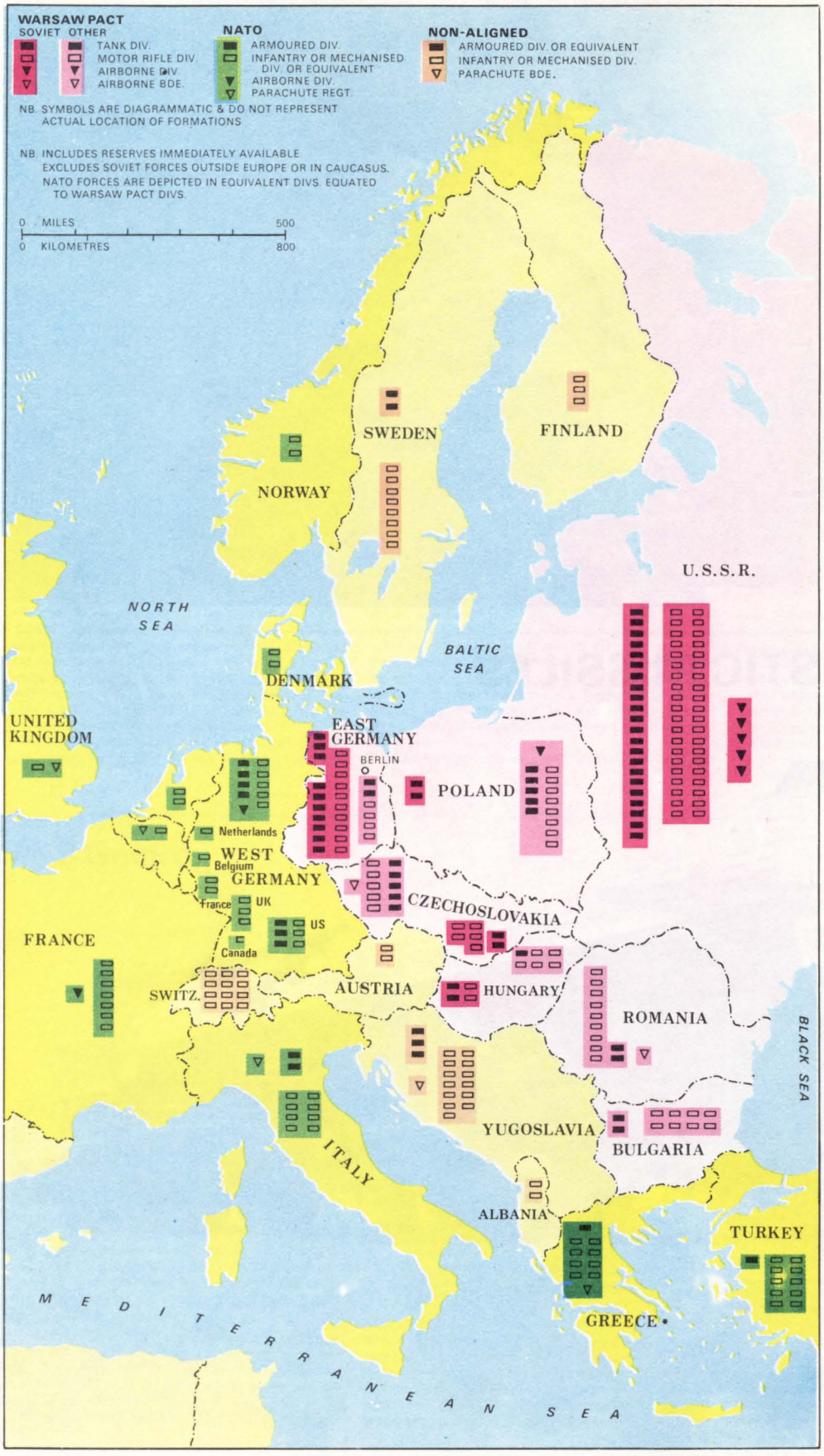


An exo-atmosphere anti-missile missile, Galosh forms part of the defence system of the Soviet capital. Four complexes have 16 launchers apiece for the most part screened by birch and fir forests. The missile first appeared in a Moscow military parade in November 1964 inside a ribbed tubular container more than 18 m (60 ft) long by about 2.7 m (9 ft) diameter on a wheeled transporter. All that could be seen were the four nozzles of the missile's first stage. It is thought that the weapon is launched from the container at a high angle.

Each of the Moscow launch complexes is associated with two Try Add engagement radars made up of a large Chekhov target-tracking radar and two smaller guidance and interception radars. Dog House phased array radars in the Moscow region provide essential acquisition and tracking, and these receive early warning from large Hen House phased-array radars in peripheral areas of the USSR.

There have been reports of an improved Galosh which can loiter in the face of an ICBM attack, stopping and re-starting its manoeuvrable 'bus' warhead near the apogee of the trajectory whilst actual warheads are discriminated from decoys. A high-acceleration point defence missile, similar to the US Sprint, has been under test at Sary Sagan. Improved ABM radars (some related to a longer-range Galosh) have been extensively tested.

NATO/WARSAW PACT FORCES LOCATED IN EUROPE



In a general war situation, Warsaw Pact Forces committed against Nato might be allocated as follows:

Soviet Forces in the Leningrad Military District against Norway.

Soviet Ground and Naval and Air Forces from the Baltic Military District, plus Polish and East German airborne and amphibious forces against Denmark, the northern coast of West Germany and Holland.

Soviet Ground and Air Forces from the Group of Soviet Forces in Germany (GSFG) and the Soviet Northern Group of Forces (NGF) in Poland, and from the Moscow and Belorussian Military Districts, plus Ground Force elements of the East German and Polish armies, against North Germany (Hanover and the Ruhr); and (together with Czech army units and elements of the Soviet Central Group of Forces in Czechoslovakia (CGF) and Soviet troops from the Kiev Military District) against Central Germany (Frankfurt).

Soviet forces from GSFG, CGF and SGF (Soviet Southern Group of Forces in Hungary) plus elements of the East German, Czech and Hungarian Armies, and troops of the Kiev and Carpathian Military Districts, against Southern Germany (Stuttgart-Munich), Austria and Italy.

Against Southern Europe and Turkey Soviet troops of the Odessa and Causcasian Military Districts and elements of the Hungarian, Romanian and Bulgarian armies.

This would give a comparison of strengths as follows (Nato forces in parenthesis):
Warsaw Pact divisions 140-150(45) tanks 27,000 (10-11,000) artillery pieces 8-9,000 (6,000) men (under arms now) 1,240,000 (1,200,000).

Although the manpower under arms is approximately equal, the Warsaw Pact capacity for very rapid mobilisation would give them a 3-1 superiority in fighting troops after three weeks of mobilisation. Nato could only close the gap after a further month had elapsed.

To what extent the Soviet Union's Warsaw Pact allies can be relied upon depends, of course, on the political situation in which conflict occurs. The startling improvement in the quality and quantity of equipment with which the USSR has equipped the non-Soviet Warsaw Pact countries since 1970 would seem to indicate that these countries are increasingly being considered by the USSR as quite reliable allies. The German and Bulgarian Armies have particularly benefitted from this trend. The Poles, Czechs and Hungarian armies in addition use good quality domestically produced equipment. Only the Romanian army has failed to show a marked improvement since 1970. Presumably, due to Romania being the least controllable regime politically and having the least important position strategically, her army is accorded the lowest priority of resupply by the USSR.

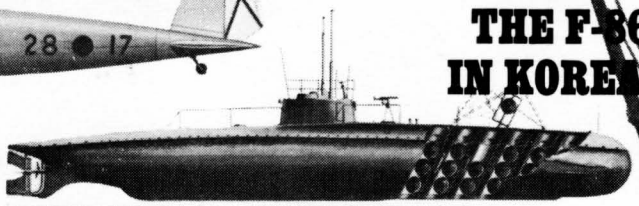
It should be borne in mind that to ensure internal security in both peace and war, all Eastern European countries have very large forces under the control of their Ministries of the Interior or State Security organisations. These forces are, to all intents and purposes, military; being equipped with small warships, combat aircraft and armoured vehicles. To quote an example: A Polish conscript might find himself called up to do not two years national service in the army, but three years in the Border Troops of the Territorial Defence Force. Poland has 80,000 such troops, Romania 45,000, East Germany 80,-100,000, Hungary 20,000, Czechoslovakia 25,000 and Bulgaria 22,000. The USSR has in addition almost half a million such troops, many of whom would be used to ensure the stability of Eastern Europe in the event of war. In addition, all Eastern European countries have TA-style militia forces involving a very large percentage of their adult male populations.

* Greece's membership of NATO is in the balance.

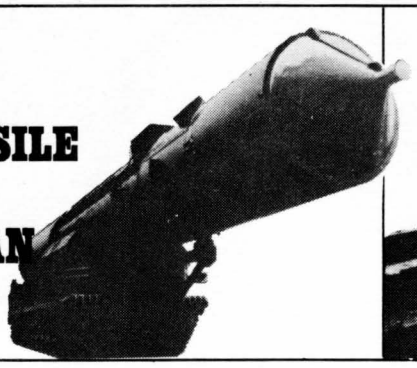
COULD THE NAZI ME-262 OR HE-111 HAVE BOMBED NEW YORK?

WHY WAS THE COMMIE MiG-15 SUPERIOR TO THE F-86 IN KOREA?

DID A GERMAN U-BOAT REALLY SINK THE LUSITANIA?



WHY CAN'T THE SOVIET 'SCAMP' MISSILE KNOCK OUT A MINUTEMAN SILO?



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